Constructions of flood vulnerability across an etic-emic spectrum

Meghan Alexander

Flood Hazard Research Centre
School of Science & Technology

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ABSTRACT

Constructions of vulnerability are varied and contested through different research traditions, such that there is no agreed definition of its meaning. In an attempt to lessen this confusion, this thesis builds upon the distinction between *etic* ("outsider") and *emic* ("insider") orientated research and examines the extent to which vulnerability knowledge can be aligned to this spectrum. The nature of emic-orientated research necessitates the identification of "insiders", who are assumed to be those 'closest' to the issue at hand and able to offer first-hand insights based on personal experience. However, it is arguably inappropriate to assume the existence of a supposedly homogeneous group of insiders, or a definitive boundary between insiders and outsiders. Therefore, this research critically examines the notion of "*insiderness*" and the extent to which this influences constructions of flood vulnerability.

Mixed methods are employed to elicit the perspectives of emergency professionals and the public in two socially-contrasting locations exposed to multiple flood drivers; a Bradford town in West Yorkshire (fluvial and pluvial flooding) and a town on the Isle of Wight (tidal and pluvial flooding). Contents analysis, semi-structured interviews and cognitive interviews facilitated by a GIS-based flood risk mapping tool ("KEEPER"), demonstrate the influence of professional roles, scales of decision making and phase of emergency management upon constructions of vulnerability. From this, it is argued that area-wide vulnerability assessment could benefit from more interactive and malleable forms of mapping, flexible to different place and hazard contexts, and professional needs.

With residents, questionnaires, in-depth interviews and vignettes reveal evidence of *hazard-centric*, *social-centric* and *existential* constructions, which inform self-declared vulnerabilities. A number of variables and processes are identified as relevant for understanding the formation of these constructions. For instance, this research documents the process of *othering*, whereby residents distance vulnerability from the self, onto a real or illusionary "vulnerable other". Moreover, analysis suggests that this is partly motivated amongst "insiders" by the need to preserve ontological security. At a time where flooding is set to increase and households are expected to embrace responsibility and act to mitigate risks to their properties, these findings highlight a potentially significant barrier to household resilience, especially in the context of pluvial flooding. On the basis of this research, recommendations are made for using the concept of "*insiderness*" to target and tailor communication and community engagement in FRM.

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GLOSSARY

Emergency management	The ensemble of activities covering emergency planning, response and recovery.
Emic	*The "insider" perspective*. In emic-orientated research, studied phenomena are examined from the perspective of the "insider". Units of analysis are discovered during the research process and not predetermined, but emergent from interaction between the researcher and research participants. The researcher seeks to understand the significance of concepts and how they are understood and experienced within a given context.
Etic	*The "outsider" perspective*. In etic-orientated research, studied phenomena are examined from the perspective of the neutral and objective "outsider". Units of analysis are predetermined by the observer, based on the underlying assumption of a single, universal reality and not informed through consultation with the subjects experiencing the phenomenon under study (i.e. the "insider").
Flood	A temporary covering of land by water outside its normal confines.
Hazard	An event resulting from natural or anthropogenic processes that has the *potential* to harm, damage or adversely affect people or other systems held as valuable.
Hazard etiology	Concerned with the physical characteristics of hazard events, influencing their spatial and temporal "shape" (e.g. causality, onset and flow-out characteristics).
Resilience	An internal component of vulnerability, referring to the ability of the social system to resist, adjust and adapt from the impact of a hazard event.
Risk	A calculation based on probability (hazard) multiplied by consequence (exposure and vulnerability)
Social vulnerability	A function of exposure, sensitivity and resilience of social systems, which influence the ability to resist, absorb, adjust and adapt from the impact of a hazard event (or other forms of environmental perturbation). Vulnerability is also shaped by the adaptive capacity of the social system, to learn, evolve and implement adaptation strategies.

LIST OF ABBREVIATIONS

CCA	Civil Contingencies Act (2004)
EA	Environment Agency
FIM	Flood Incident Management
FRM	Flood Risk Management
GIS	Geographic Information Systems
IEM	Integrated Emergency Management
IMD	Index of Multiple Deprivation
KEEPER	Knowledge Exchange Exploratory tool for Professionals in Emergency Response
LA	Local Authority
LRF	Local Resilience Forum
MAFP	Multi-Agency Flood Plan
RQ	Research Question
SFVI	Social Flood Vulnerability Index

Introduction

Chapter 1

Constructions of vulnerability are varied and contested through different research traditions and disciplinary contributions, such that there is no agreed definition of its meaning. In an attempt to lessen this confusion, this thesis builds upon the distinction between *etic* ("outsider") and *emic* ("insider") orientated research and examines the extent to which vulnerability knowledge can be conceptualised and aligned to this spectrum. The nature of emic-orientated research necessitates the identification of "insiders", who are assumed to be those 'closest' to the issue at hand and able to offer first-hand insights based on personal experience. However, it is arguably inappropriate to assume the existence of a supposedly homogeneous group of insiders, or a definitive boundary between insiders and outsiders. Therefore, this research critically examines the notion of "*insiderness*" and the extent to which this influences constructions of flood vulnerability. Insights from emergency professionals and residents located in areas at risk of flooding are elicited in two UK case studies and juxtaposed to fully examine the etic-emic gradient upon which constructions of vulnerability may be aligned.

The vulnerability-orientation of this thesis is justified by a number of reasons. Firstly, there is evidence to suggest that the risk of flooding in the UK will increase under scenarios for climate change, with sea level rise and increased precipitation heightening the likelihood of tidal, fluvial and pluvial flooding (Evans et al., 2004; 2008; EA un-dated). In addition, increased flooding may also be connected to human interventions, such as land use change (e.g. urbanisation). Prominent flood events over the past decade have highlighted the economic, social and environmental significance of flooding; such as the Autumn floods in 2000, summer 2007 floods and the 2012 floods. In parallel, it has been recognised that flood prevention through defence networks is not feasible for every at-risk location; rather Flood Risk Management (FRM) requires a portfolio of structural and non-structural solutions to minimise the adverse, tangible and intangible consequences of flooding (Defra, 2005: Defra, 2009; EA, 2010a). Within this risk-based framework, vulnerability is acknowledge as an integral aspect of FRM (Hall et al., 2003). Moreover, the transition in flood management culture away from prevention and defence, towards integrated flood FRM and whole systems analysis, has increased attention to social and environmental considerations for delivering sustainable and socially-just FRM (Hall et al., 2003: Defra, 2004; Johnson et al., 2005).

This reflects a deeper paradigm shift in natural hazards and disaster research beyond the biophysical dominance of the natural sciences, towards the integration of social sciences and introduction of *risk* and *vulnerability* paradigms (White et al., 2001). Whereas early hazard research was shaped by environmental determinism and the assumption of a unidirectional relationship between cause (hazard event) and effect (impact) (White et al., 2001); the vulnerability perspective draws attention to the *socially constructed* aspects of disasters. Rather than conceiving hazards and disasters as simply natural, extreme events, the vulnerability paradigm has emphasised the importance of reconceptualising these within "*the ordinary and the everyday*" (Fordham, 1998: 140). Research has highlighted the social disparities in the experience and distributions of adverse impacts from hazardous events and introduced debates about underlying social, political and economic factors in which vulnerability is arguably rooted (Blaikie et al., 1994: Fordham, 1998; Enarson and Morrow, 1998; Tapsell, 2000; Wisner et al., 2004). Research has also promoted community involvement, goals of empowerment and democratisation of knowledge (White et al., 2001: Heijmans, 2001).

This expanding research field has contributed to a corresponding shift in policy, recognising the need to address natural hazards and disasters, sustainable development and poverty reduction as cross-cutting themes (UN/ISDR, 2005). The Hyogo Framework for Action[1] (2005-2015) for instance, underscores the actions of the International Strategy for Disaster Reduction[2] (ISDR) and emphasises the need for vulnerability mitigation in the pursuit of resilient societies. Explicit attention is given to the needs of certain groups, particularly relating to age, gender and cultural diversity, and integration of these perspectives within decision making, as well as tailored early warning (UN/ISDR, 2005). In the pursuit of methods to assess and monitor vulnerability, the HFA states the need for global, and nationally-tailored, indicators and indices to inform decision making. Simultaneously, the framework emphasises the importance of participation across stakeholder groups to foster knowledge exchange, partnership-working and empowerment, particularly local authorities and communities, to manage and reduce their disaster risk.

[1] Following the World Conference on Disaster Reduction in 2005, the Hyogo Framework for Action (HFA) outlined a ten year plan of action (2005-2015) to address increasing global vulnerabilities:
(Available from http://www.unisdr.org/we/inform/publications/1037).

[2] The UN International Strategy for Disaster Reduction (ISDR) was launched in 2000, following the International Decade for Disaster Reduction (1990-2000) and marked a significant policy shift towards more holistic understanding of disasters and cross-cutting nature of disaster mitigation, poverty reduction and sustainable development.

Finally, policy shifts in the UK have encouraged the devolution of risk responsibility and request for households and local communities to become more involved in FRM decision making and take ownership for managing their personal risk (e.g. "*Making space for water*", Defra, 2005; Johnson and Priest, 2008). Indeed, self-reliance was a key recommendation from the Pitt Review after the 2007 Summer Floods (Pitt, 2008). Simultaneously, vulnerability-based concepts in policy are being embraced by the Environment Agency (EA) in the UK (Twigger-Ross and Scrase, 2006). Recommendations for developing a policy on flood vulnerability, have emphasised the importance of locally *relevant* and *meaningful* definitions of vulnerability, and tailoring communications accordingly (Twigger-Ross and Colbourne, 2009). This represents a significant shift from the once dominant conception of vulnerability as belonging to certain (homogenous) socio-demographic groups. Instead of externally-imposing identities of vulnerability, individuals and communities affected by flooding are recognised as "*uniquely positioned to identify the relevant risks, and factors affecting resilience to them, in a given community"* (Twigger-Ross and Scrase, 2006: 73). The official aspirations outlined in this document, aim to target and mitigate vulnerability through the use of networks, gatekeepers and participatory activities, and ultimately encourage people to reduce their own vulnerability; as well as the vulnerability of others within their social networks. However, whilst residents' constructions of *risk* have been widely researched (e.g. Burningham et al., 2008), constructions of vulnerability have been somewhat side-lined. Insight into these constructions, and the variables shaping self-declared vulnerabilities, could reveal opportunities and barriers to enhancing self-reliance and resilience amongst households at-risk of flooding.

This thesis aims to examine how constructions of vulnerability vary across etic-emic gradients. To address this, this research examines social vulnerability from the perspectives of two main groups: Professionals concerned with Flood Incident Management (FIM), who must identify and act upon vulnerability in an emergency situation; and the public, including those within and outside objective boundaries of risk and vulnerability. This research is guided through 3 central questions:

> **RQ1**: How is vulnerability constructed and experienced by residents in locations at risk of flooding? What are the variables influencing self-declared vulnerabilities? What are the implications of self-declared vulnerabilities?
>
> **RQ2**: How is vulnerability constructed by emergency professionals? How do these constructions shape identities of vulnerability and professionals' expectations of people's ability to respond and recover from flooding?

> **RQ3**: Is it possible to infer degrees of "insiderness" and define insider-outsider boundaries amongst research participants? To what degree does *insiderness* influence constructions and declarations of vulnerability? Can these constructions be aligned to the etic-emic spectrum?

To begin, **Chapter 2** reviews the evolution of vulnerability in academic research and the conceptual position of vulnerability in relation to adjacent concepts of risk, resilience, coping and adaptive capacity. In the second half of this Chapter, a conceptual model is presented to unpick the etic-emic distinction (defined in Box 1.1). Although these terms have a long legacy in psychology and anthropology, the etic-emic distinction has only recently filtered into the field of natural hazards research (Fielding and Fielding, 2008). Arguably the field of natural hazards and disasters research could benefit from this form of conceptual clarity, yet to-date, there has been little effort to conceptualise how existing research is positioned across this gradient. This chapter is therefore a first step in this direction. Gaps in current knowledge are also identified leading to the research questions above.

BOX 1.1: Etic and emic distinctions

Etic – *(adj.use)* in which studied phenomenon are examined from the perspective of the neutral and objective "outsider". Units of analysis are predetermined by the observer, based on the underlying assumption of a single, universal reality.

Emic – *(adj. use)* in which studied phenomenon are examined from the perspective of the "insider". Units of analysis are discovered during the research process and not predetermined but emergent from interaction between the researcher and research participants. The researcher seeks to understand the significance of concepts and how they are understood and experienced within a given context; whilst recognising their own positionality within the research process.

Chapter 3 outlines the contextual background relevant to this research, focusing on the policy and geographical contexts in which it is set. The former includes the context of emergency management and Flood Incident Management (FIM) in the UK, which underscores the roles of emergency professionals interviewed as part of this study. This contextual background is important for understanding how professionals' constructions of vulnerability are informed and the analysis presented in Chapter 8. Secondly, this chapter describes the geographical, social and flood contexts for the two selected urban catchments in the UK; a Bradford town in West Yorkshire, northern England, and a town on the Isle of Wight, located off the Hampshire coastline in southern England. Also discussed in this chapter is the relationship between this research and the Flood Risk Management Research Consortium (FRMRC), through which this

study was partially-funded. Available through FRMRC were detailed local-scale flood inundation visualisations derived from 1D-2D modelling and applied to the selected case studies (Allitt et al., 2009; Chen et al., 2010). This modelling partially informed the sampling strategy and also contributed to the development of a GIS-based flood risk assessment tool for emergency professionals, christened KEEPER (reported in Alexander et al., 2013). In this research, KEEPER was adapted as an elicitation technique to facilitate cognitive interviews with emergency professionals and is further elaborated in Chapter 7.

Chapter 4 justifies and develops the overall approach and presents the research design of this study. This thesis tries to adopt a meta-view that straddles the etic-emic debate and does not assume the supremacy of one perspective over the other. Instead, this thesis consciously reflects on the gradient between the two and its value for understanding flood vulnerability. This meta-view is reflected in the range of methods employed in this research, which partially stretch across the etic-emic spectrum and create different conceptual 'distances' between the researcher and the researched to provide different perspectives on the research questions addressed in this thesis. To some extent, the use of different methods results in the adoption of the different rhetoric attached to these. However, the research is fundamentally approached from a *social constructivist* perspective to examine how vulnerability is constructed and possibly contested by emergency professionals and residents in flood prone locations; as well as in research itself.

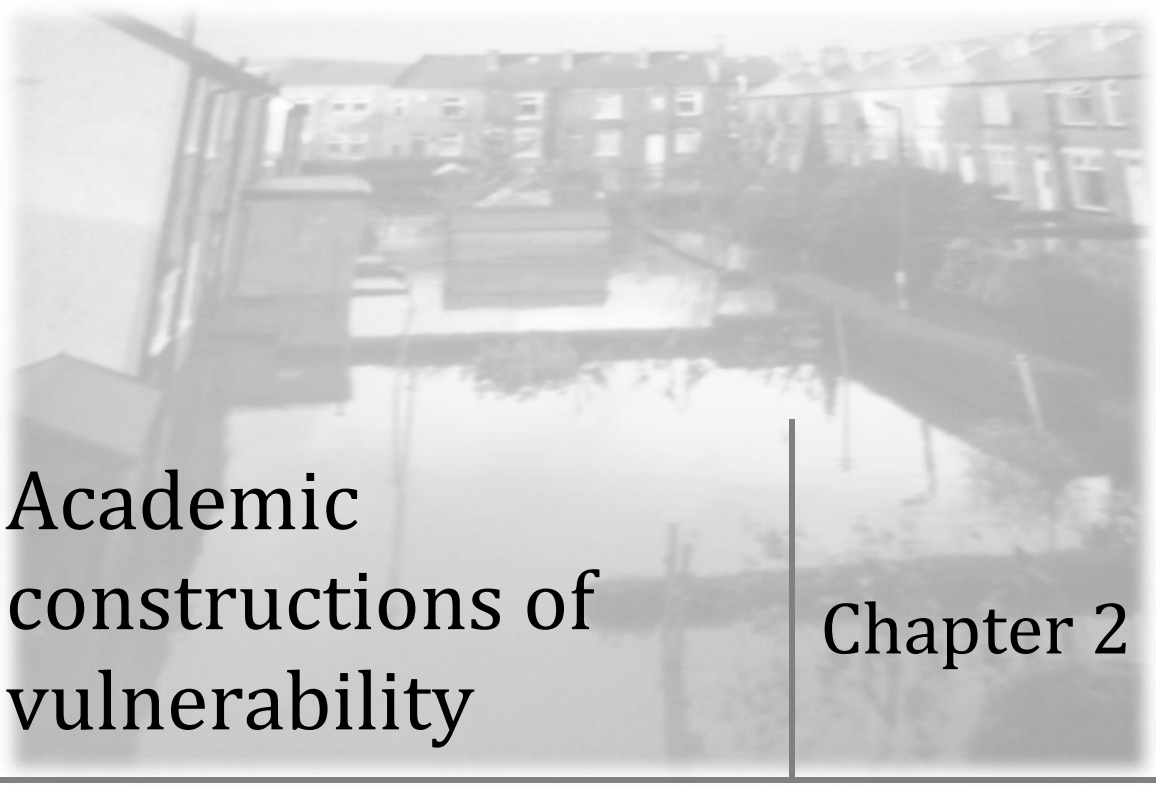
To address the research questions, the thesis is divided into 2 phases. The methods for Phase 1 of this research are also presented in Chapter 4. Analytical discussions in Chapters 5 and 6 examine constructions of flood vulnerability and explore the possible variables influencing self-declared vulnerability amongst *residents* located in the selected case studies. Phase 2 examines the perspectives of *emergency professionals* and is presented in Chapters 7 and 8.

Methods for eliciting residents' perspectives include the use of questionnaires, in-depth interviews and vignettes (Chapter 4). Data from preliminary flood risk awareness questionnaires and post-interview questionnaires are analysed in **Chapter 5**, in order to identify variables relevant for understanding residents' views on flooding and self-declared risk, vulnerability and coping. Additionally, synergies and disparities between subjective and objective formulations of risk and vulnerability are considered in this section.

Chapter 6 analyses the qualitative contributions from in-depth interviews and vignette-elicited discussions. In this section, three distinct, though often overlapping constructions of vulnerability emerge that are *hazard-centric, social-centric* and *existential* in nature. Processes for spatial and social *othering* are also identified as a mechanism for distancing vulnerability from the self onto a "vulnerable other" and are developed in this chapter. Residents' degree of "insiderness" is assessed, both objectively and subjectively, across the axes of flood experience, awareness and flood exposure. In turn, the concept of "insiderness" is examined as a possible explanatory variable for variations of self-declared vulnerabilities. The extent to which other findings reported in this chapter are aligned to this gradient of "insiderness", is also evaluated.

Chapter 7 outlines the methods employed for eliciting the views of emergency professionals (Phase 2). A multi-stage approach is presented, including content analysis of professional literature, semi-structure interviews and cognitive interviews facilitated by a GIS-based flood risk mapping tool, "KEEPER" (a Knowledge Exchange Exploratory tool for Professionals in Emergency Response). Corresponding analysis and interpretations are discussed in **Chapter 8**. This chapter examines how constructions of vulnerability are informed by professional roles and scales of decision making enacted through the different phases of the emergency management cycle. The challenge of defining boundaries of "insiderness" is also outlined here.

Returning to the aim and research questions, **Chapter 9** establishes the main conclusions and unique contribution of this research in reinvigorating and extending the etic-emic debate. The influence of "insiderness" upon constructions and declarations of vulnerability is highlighted and further light is shed on why some people embrace their vulnerability where others reject it. Implications for flood risk management and future assessments of vulnerability are discussed and areas for future research highlighted. This study contributes to an existing wealth of vulnerability knowledge, emphasising the socially constructed nature of vulnerability, to which this thesis now turns.



Academic constructions of vulnerability

Chapter 2

CONTENTS

2.1 INTRODUCTION

The purpose of this chapter is to examine how vulnerability is *constructed* within academia in the context of natural hazards and disasters. The notion that there exists '*academic constructions*' of vulnerability, derives from the underlying assumption of this thesis that all forms of knowledge constitute a construction of reality. Despite the wide application of the concept of vulnerability, its meaning is widely contested through different disciplinary orientations and theoretical fracture lines, such that there is no one accepted definition (Clark et al., 2000: Few, 2003; McLaughlin and Dietz, 2008). Adding to this confusion, its conceptual relationship with other concepts of risk, resilience, coping capacity and adaptation, is debated in the literature. Before defining vulnerability for the purpose of this thesis, the first half of this chapter outlines the different theoretical debates in vulnerability research and then considers how vulnerability is conceptually positioned in relation to these additional concepts.

In an attempt to resolve some of the confusion, the second half of this chapter examines the *etic-emic* (outsider-insider) debate, introduced in psychology and anthropology disciplines. Arguably the field of natural hazards and disasters research could benefit from this form of conceptual clarity, yet to-date, there has been little effort to fully conceptualise the etic-emic framework, or to examine how existing research is positioned across this gradient. This gap is addressed here and different academic constructions of vulnerability are reviewed and aligned to this etic-emic spectrum. Research questions are emergent from this review and outlined in the conclusion of this chapter.

2.2 THEORETICAL FRAMEWORKS FOR VULNERABILITY THINKING

A number of different theoretical positions and frameworks are presented for addressing the relationship between social structure, human agency and the environment (McLaughlin and Dietz, 2008). These "theoretical fracture lines" vary in their interpretations of the variables that cause, sustain and shape vulnerability across people and place (Clark et al., 2000; Tierney, 2007). An understanding of these theoretical positions is required in order to grasp the concept of vulnerability.

Essentially there are two main schools of thought dividing vulnerability theories. Firstly, the **biophysical** school of thought ascribes to the view that vulnerability is generated by the

occurrence of natural hazards (O'Brien et al., 2004). This traditionally dominant perspective is rooted in the natural sciences and relates the spatial patterns of vulnerability to the boundaries of the hazard or environmental variability (McLaughlin and Dietz, 2008; Wilson, 2008). In this context, the *etiology* of the hazard is relevant to understanding patterns of vulnerability, related to the "shape" and characteristics of the hazard event (onset, duration, frequency and magnitude etc.) (Tapsell et al., 2010). Consequently, primary attention in this field is limited to understanding the physical processes of natural phenomenon and the technological solutions that can be applied to manage these, and reduce vulnerability (Heijmans, 2001). Although the technological contributions from this perspective have been praised, there are a number of criticisms and concerns for conceptualising vulnerability purely within biophysical terms. Chiefly, this paradigm is criticised for treating the human population at-risk as mere passive receptors, with the impacts of a hazard arising from the nature of the hazard event itself and the effectiveness of hard-engineering; thus neglecting human response mechanisms which can enhance or lessen hazard impact (Turner et al., 2003). The role of social, political and economic factors is thus overlooked, alongside questions concerning the potential influence of these factors upon the spatial and temporal patterning of exposure and vulnerability (Cutter and Finch, 2007; Wisner et al., 2004). Furthermore this paradigm fails to account for reported differences in impacts, across people and place that seem to result from a single hazard event (Hewitt, 1997). Finally, it has been argued that reliance on scientific 'expertise' and the export of westernised discourse on hazard management into so-called 'unsafe' localities, can actually heighten vulnerability (Bankoff, 2001); not least because engineered defences may fail, but through the erosion of local participative capacities (Delica-Willison and Willison, 2004; Lorenz, 2010).

Beyond biophysical thinking, an alternative school of vulnerability theories has arisen within the social sciences. Several theories have emerged from the study of hazards and disasters, as well as adjacent fields of climate change, environmental change and development, which draw attention to the social production of vulnerability (Few, 2003; Lorenz, 2010). From the perspective of **human ecology** theory, vulnerability is the result of the coupling between human-environmental systems. The environment is recognised as a source of hazard and subject to anthropogenic processes (e.g. environmental degradation); both of which may enforce or create vulnerability. Kates (1971) introduced the notion that societal functioning operates through a number of short-term, homeostatic and self-regulating adjustments, and long-term dynamic and evolutionary adaptations. Influentially, Kates proposed a series of

successive, techno-social stages through which human systems evolve to exert greater control over nature; thus enhancing capacity of the system to absorb or buffer the adverse effects of environmental variability and natural hazards (McLaughlin and Dietz, 2008). This model has been highly influential and introduced notions of resilience and adaptation (Holling, 1973: Adger, 2000; Folke, 2006); however, it is criticised for its essentialist[3] philosophical foundations and implied assumption that human systems merely follow a natural path of change (McLaughlin and Dietz, 2008). Moreover, this theory fails to capture the influence of other determinants of human behaviour; such as political and economic pressures, power relations and social inequalities (Eriksen et al., 2005).

This latter critique emerges from **political economy** theories, which draw from Maxist traditions and emphasise the important role played by societal structuring (i.e. class and social institutions), in creating patterns of vulnerability (Hewitt, 1983: Oliver-Smith, 1996; Cannon, 2000). This theory has been particularly influential in frameworks such as the *Pressure and Release model* (Blaikie et al., 1994), the *Access model* proposed by Wisner et al. (2004) and theories for livelihood and entitlements (Sen, 1983: Adger and Kelly, 1999). In contrast to the human ecology approach, in political economy models vulnerability is not determined through the environment *per se*, but through the social structures that shape human relationships with the environment; i.e. livelihoods and access to political and economic resources (Pelling, 2003: Eriksen et al., 2005). Political economy theory draws attention to the root causes of vulnerability and has helped underscore the importance of political will in delivering effective mitigation strategies (e.g. UNDP, 2004; in McLaughlin and Dietz, 2008). However, the main criticism attached to political economy theory is that it neglects the environment as an independent factor contributing to societal functioning (McLaughlin and Dietz, 2008). Increasingly, this has led to the cross-fertilisation of human ecology and political economy perspectives and the development of political ecology theory.

The premise of political economy theory appears in a number of conceptual frameworks emergent in the context of sustainable development (Turner et al., 2003), livelihoods (Chambers and Conway, 1992), food security (Bohle et al, 1994), disasters (Blaikie et al., 1994) and environmental change (e.g. *Panarchy theory*, Gunderson and Holling, 2001). This theory maintains an emphasis on adaptation (proposed through human ecology) but extends this into

[3] *Essentialism* describes a philosophical belief and practice of regarding e.g. people as having an innate existence, embodied in discernible (and universal) characteristics or properties, which can be defined and described (e.g. male/female). This theory is aligned to realist epistemology is social science.

the political economic context, which ultimately shapes human-environmental relations and expressions of vulnerability (Oliver-Smith, 2004). To understand disasters therefore becomes an investigation into the co-evolutionary relationship of human societies and natural systems (Oliver-Smith, 2004). Relational models, such as the *Access model* proposed by Wisner et al., (2004) are characterised by a progressive move away from the traditional, reductionist and essentialist models proposed by early political economy and human ecology theories. The premise of political ecology is subsumed within social-ecological perspectives to vulnerability and resilience (Adger, 2006); and also reflected in geographical perspectives combining biophysical and social systems in conceptual frameworks of vulnerability (Cutter et al., 2003; 2008).

Arguably, the theories presented so far demonstrate a tendency to overlook the role played by human agency and risk portraying those labelled as 'vulnerable' as mere passive receivers of their vulnerability disposition (Birkmann, 2006). Additionally, there is a tendency for risk to be conceptualised as objectively "out there" (Tierney, 1999). Moreover, the process of defining 'disaster' is not a neutral, value-free act, but a means of setting political agendas (O'Malley, 2004). In response, **constructivist** theorists have applied critical relativism to examine social constructions of risk and vulnerability. Fundamentally, this theoretical tradition is underlined by nominalist[4] principles, drawing attention to the socially constructed nature of taken-for-granted categories, such as gender, race and class, informing differential experiences of vulnerability (Morrow, 1999). Influentially, this body of research has helped shift and sensitise agendas for disaster management to the different needs of certain groups (Fordham, 2004). Attention is also given to the influence of culture in shaping interpretive frames (Bankoff, 2001: Button, 2002; Oliver-Smith, 2004; 1996; Furedi, 2007). Whilst more radical approaches are criticised for staunch nominalism and a failure to acknowledge components of 'reality' (e.g. the biophysical environment); a number of moderate constructivists frameworks are presented (Rosa, 1999; McLaughlin and Dietz, 2008).

Although this section has summarised and distinguished the foundations of different theoretical frameworks in the literature, these approaches are being increasingly integrated to examine vulnerability across the contexts of development (and sustainability), poverty and disasters; as emphasised in policy (Chapter 1; Janssen et al., 2006; McLaughlin and Dietz, 2008). The main point to observe here, is that these theoretical 'fracture lines' present

[4] Nominalism describes a philosophical belief that there are no universal essences in reality. This theory is aligned to relativist epistemology in social science.

different *entry points* for understanding (and defining) vulnerability. This thesis is underlined with constructivist ideals and discussed further in Chapter 4.

2.3 CONCEPTUAL POSITIONING OF SOCIAL VULNERABILITY

These different theoretical approaches and disciplinary backgrounds have resulted in a range of contested definitions of vulnerability and different interpretations of its conceptual position towards related concepts of risk, resilience, coping capacity and adaptation (Gallopín, 2006: Janssen et al., 2006). Some examples are presented in Box 2.1. There is a general consensus that vulnerability is a multi-dimensional and multi-faceted concept (Downing et al., 2006; Birkmann, 2006; Parker and Tapsell, 2009). Thus, part of the conceptual confusion with vulnerability results from the umbrella nature of the term and lack of explicit reference amongst authors to the specific facet (or dimension) of vulnerability under consideration (e.g. physical, economic, social, institutional etc.; Parker and Tapsell, 2009).

This thesis is concerned with the study of *social* vulnerability, but the term social can also function as an umbrella term to include multiple social scales, structures and institutions. Whilst a definition is warranted, a degree of caution must be exercised in confining the study of vulnerability to social boundaries, particularly when such boundaries are not divorced from other facets of vulnerability (Parker and Tapsell, 2009: Fuchs, 2009). For clarity, "social" broadly refers to the study of people (individuals and social groups) and it is in this context that future discussions of vulnerability are situated in this thesis.

Further confusion is created through the conflicting representations of vulnerability. Some authors present vulnerability as a *property* of the system (e.g. the social system) and are concerned with a series of attributes, such as socio-demographic characteristics and social capital (e.g. Wisner et al., 2004: Gallopín, 2006). In contrast, other scholars define vulnerability in terms of the relationship between the system and the perturbation to the system and therefore represent vulnerability as a *process and outcome* of this interaction between systems (Few, 2003: Gallopín, 2006). Indeed, Green and McFadden (2007) argue that, ultimately, vulnerability discourse is concerned with the *consequences* of interacting systems and define vulnerability as "*a conceptual bridge between some change in the environment of a system and the response of the system*". Underlying these academic constructions of

vulnerability is the normative notion of thresholds between a desired and undesired state of existence; and with this, an implied course of action (i.e. reduction of vulnerability; Green and McFadden, 2007).

BOX 2.1: Some example definitions of vulnerability	**Author**
Vulnerability denotes exposure to risk and an inability to avoid or absorb potential harm.	Pelling (2003: 5)
The characteristics of a person or group and their situation, that influence their capacity to anticipate, cope with, resist and recover from the impact of a natural hazard.	Wisner et al. (2004: 11)
Social vulnerability is the product of social inequalities' It is defined as the susceptibility of social groups to the impacts of hazards, as well as their resiliency or ability to adequately recover from them…susceptibility is not only a function of demographic characteristics…but also more complex constructs such as health care provision, social capital and access to lifelines.	Cutter and Emrich (2006)
The exposure of groups or individuals to stress, as a result of social and environmental change, where stress refers to unexpected changes and disruption to livelihoods.	Adger (1999: 249)
Social vulnerability emanates from social factors that place people in highly exposed areas, affect the sensitivity of people to that exposure, and influence their capacity to respond and adapt.	Yarnal (2007)

Birkmann (2006) observes the increasing complexity of definitions of vulnerability. Whilst early research addressed human-centric definitions of vulnerability related to the likelihood of experiencing harm (susceptibility); the concept has broadened to recognise multiple structures and dimensions of vulnerability. With regards to structure, the reviewed literature presents a number of conflicting views about the "make-up" of vulnerability and its relationship to adjacent constructs of resilience, coping and adaptive capacity, and broader discussions of risk. Indeed, Janssen et al. (2006) observe how these knowledge domains have expanded and become more entwined since the 1990s with the increasing political interest in global environmental change. This section now turns to these debates to examine the conceptual positioning of vulnerability.

2.3.1 POSITIONING SOCIAL VULNERABILITY IN THE CONTEXT OF RESILIENCE, COPING & ADAPTATION

From the literature, it is clear that the study of social vulnerability is fundamentally concerned with *consequence* and therefore also requires an understanding of human responses (Adger and Kelly, 1999; Few, 2003; Green and McFadden, 2007). Increasingly, research has emphasised the non-passivity of human systems and strategies for enhancing social capacity to withstand, adjust and adapt to change and shocks to the system (Fordham, 2004; Eriksen et al., 2005; Kuhlicke and Steinführer, 2010). From this perspective, vulnerability is conceptualised within a causal chain of events, interacting with concepts such as resilience, coping and adaptation. For example, mitigating vulnerability is seen as a strategy for improving resilience, or enhancing adaptation is regarded as a means of reducing vulnerability (Brooks et al., 2005: Smit and Wandel, 2006).

The affinity and relationship between vulnerability and resilience is widely contested in the literature (Gallopín, 2006; Birkmann, 2006). This debate is partially rooted in the theoretical fracture lines discussed in Section 2.2; however to unravel this, there is a need to firstly address the definitions of **resilience**. Essentially, there are three schools of resilience thinking. From an *engineering perspective*, resilience concerns the ability of the system to *resist* disturbance and the speed of recovery, or ability to 'bounce back', to the pre-existing state (equilibrium), prior to the disturbance: Resilience is thus a measure of *return* (Pimm, 1984: Wilson, 2008). In contrast, *ecological perspectives* for resilience address the ability of a system to absorb and persist at its current level of functioning before it is required to adjust to a new state of change. In this context, resilience is a measure of *functioning* and *capacity for absorption* (Holling, 1973: 17; Gunderson and Holling, 2001). Descriptions often include references to the adaptive cycle as a metaphor for system dynamics and include concepts of domains (or basins of attraction[5]) and trajectories towards "attractors" (Gunderson and Holling, 2001: Gallopín, 2006). These first two paradigms draw heavily from human ecology theory and imply that social systems can be modelled in a manner similar to ecological environments.

[5] Defines as "the portion of the state space of a dynamic system that contains one "attractor" toward which the state of the system tends to go"; if no perturbation were to occur, the system would remain within this domain. An "attractor" ultimately characterises the behaviour of the system (see description in Gallopín, 2006).

The application of ecological principles to social structures has naturally sparked debate in the social sciences (Adger, 2006). On one hand, natural resources support society and thus ecological resilience is key concern, particularly in resource-dependent communities. On the other, social organisation is driven by institutions (habitalised behaviour, norms, rules as well as formal and informal organisations) and the historical and cultural context in which these institutions evolve (Adger, 2006; Oliver-Smith, 2004); as highlighted by political economy theorists (see Section 2.2.1). The final resilience paradigm therefore addresses this coupling between ecological and social systems to consider a *socio-ecological* form of resilience. This perspective highlights the importance of *adaptive capacity* as a key feature of resilience (Adger, 2006). Vulnerability is in turn influenced by the amplification or erosion of resilience (Adger, 2006). The socio-ecological perspective arguably provides a more holistic way of thinking and is widely discussed in Socio-Ecological Systems (SES[6]) research (Carpenter et al., 2001: Young et al., 2006; Gallopín, 2006). To be deemed truly resilient a community cannot simply 'return to normal' or merely persist after a stressful event. Processes for adjustment, learning and adaptation are emphasised in the step towards a more desirable resilient state; even if this is not intentional, societal systems will unavoidable change and *cannot return to the status quo prior to the event* (Steinfuhrer et al., 2009: Folke, 2006).

Whilst there is a clear relationship between the concepts of vulnerability and resilience, authors' attempts to define this relationship can be summarised into four categories. Firstly, tautological, *binary* conceptualisations present vulnerability and resilience as alternative expressions of one another (Downing and Franklin, 2004; Villagran de Leon, 2006). In this context, vulnerability is simply the 'flip side' of resilience. Secondly, some authors distinguish this relationship across a *temporal axis*. For instance, Gallopin (2006) argues that vulnerability can be understood as predisposing characteristics of the at-risk community (prior to and during hazard impact), and resilience a feature of response. Similarly, Buckle et al. (2001) agree that resilience is a feature of recovery, but contend that vulnerability is relevant throughout the disaster management cycle (Steinfuhrer et al., 2009). For some authors, vulnerability and resilience are conceived as *separate but related* constructs, relevant for the study of different social units. Whereas vulnerability is conceived as a feature of the individual or household, resilience is described as a feature of the community and their institutions (Wilson, 2008). Finally, there is a selection of authors conceptualising resilience as an integral and internal

[6] SES defined by Gallopín (2006) as "*a system that includes societal (human) and ecological (biophysical) subsystems in mutual interaction*".

component of vulnerability (Pelling, 1998: Clark et al., 2000; Bohle, 2001; Cardona, 2003). It is to this latter interpretation that this thesis subscribes.

Attached to discussions of resilience and vulnerability are the concepts of **coping and adaptation**. In the context of UK flooding for example, policies for FRM have emphasised the importance of enhancing the self-reliance of individuals and communities to cope and adapt to increasing flood risk (EA, 2006; see Chapter 1). This discourse indicates a shift towards community empowerment, beyond historical dependency upon flood defence (Few, 2003). Moreover, particular events and crises have been identified as catalysts for such policy changes (Johnson et al., 2005; Adger et al., 2005). In this context, hazards or environmental change are viewed positively, as providing a window of opportunity for beneficial transformations (Gallopín, 2006).

Adaptation is commonly conceived as a process or outcome (of adaptive capacity) enabling a social system to cope and adjust to changing conditions (Smit and Wandel, 2006). Inherent in this discourse, is the capacity to learn, evolve and improve social capacity (Gallopín, 2006). In the causal chain of events, adaptation is seen as a means of reducing social vulnerability (Brooks et al., 2005). Indeed, Adger et al. (2005) explain that the purpose of adaptation is to reduce *sensitivity* and *exposure*, and heighten *resilience*; three concepts which are typically described as cornerstones of vulnerability. Methods for building adaptive capacity may for example include risk communication, awareness raising activities and enhancing access to resources (e.g. insurance; Adger et al., 2005). According to Smit and Wandel (2006), vulnerability is in-part a function of adaptive capacity. These authors contend that local adaptive capacity (and manifest adaptations) may be constrained by broad-scale processes (e.g. environmental, social, economic, institutional and political), which in turn affect exposure and sensitivities. Similar arguments are reflected in the political economy theories discussed in Section 2.2 (Adger and Kelly, 1999; Wisner et al., 2004; Walker, 2005).

Numerous classifications for adaptation exist, relevant to time, intent, spatial scope, form and degree (or depth) of transformation (Smit and Wandel, 2006; Gallopín, 2006). For example, Adger and Kelly (1999) define adaption as the *deliberate* strategies for social and policy learning that enable evolutionary responses to environmental change. Other authors draw a temporal distinction between the concepts of coping and adaptive capacity; arguing that former is a reactive and short-term manifestation, whereas the latter reflects long-term

adjustments (e.g. Folke et al., 1998; Kasperson et al., 2005; or vice versa, see Lorenz, 2010). However, the two are recognised as inter-dependent, as the range of coping may increase or decrease over time and correspondingly influence adaptive capacity (Smit and Pilifosova, 2003). This perspective is echoed in the conceptual framework presented in this chapter (Figure 2.1).

There is an apparent overlap between adaptive capacity and the concept of resilience. Indeed, Holling (2001) defines adaptive capacity as the "*resilience of the system*" (p394), describing adaptation as a continuous cycle of transformation operating at different scales. Holling further argues that identifying points where system change is possible could create "*leverage points to foster resilience and sustainability within a system*" (p392). Other authors have argued that adaptive capacity is a component of resilience, reflecting social learning (Carpenter et al., 2001). In contrast, resilience has also been portrayed as an expression of adaptive capacity (Walker et al., 2004). Whilst the analogy to ecology has proved conceptually compelling, there are key differences between ecological and social systems of which the symbolic dimension of meaning is one. Lorenz (2010) presents an alternative view of social resilience centred on the idea that symbolic constructions of meaning drive social expectations. In this context, resilience is understood as the ability to avoid or withstand failed *expectations* which result in disaster. Lorenz argues that human behaviour is shaped through the process of reflection, based on awareness of the past and anticipations for the future. In this thesis, adaptive capacity is understood as a separate, but related construct that is both *influenced by* and *influential to* vulnerability (Figure 2.1).

Coping capacity is a term widely referenced in the context of adaptation and resilience. Though sometimes subsumed within discussions for adaptive capacity, Folke et al. (1998) argue that adaptive and coping capacities are distinct features of *resilience* and can be separated by the timescales in which they operate. Coping is therefore understood as a short-term strategy for managing and adjusting to the immediate stress posed by a hazard event; whereas adaptation necessitates a longer process of learning (Turner et al., 2003; Eriksen et al., 2005; Brooks et al., 2005). Other authors have argued that coping is a distinct component of vulnerability, shaped through broader constraints and opportunities (e.g. linked to access to resources: Eriksen et al., 2005; Gallopín, 2006). These conceptual distinctions are equally supported in this thesis.

This notion of 'capacity' is critiqued in the social policy literature. For example, Craig (2007) argues that community capacity building is politically fashionable, but assumes a deficit model, representing the failure of governments to properly engage with "bottom-up" development. Discourse on vulnerability have also received criticism for neglecting the capacities of individuals and communities to cope and adapt to environmental change and natural hazards. Indeed, Bankoff (2001) argues that the concept of vulnerability constitutes a form of *symbolic violence* that '*renders the world unsafe'* and creates the impression that developing countries in particular, are made up of weak and passive communities. Arguably, the increasing focus on resilience, coping and adaptive capacities seek to address this, as well as emphasise the positive (rather than purely negative) connotations associated with the concept of vulnerability (Adger and Kelly, 1999: Few, 2003). It is argued here, that these concerns are not inherent to the concept of vulnerability *per se*, but to the different epistemological, methodological, and disciplinary standpoints of the researcher.

A conceptual model of vulnerability

The above discussions have grappled with the range of conflicting perspectives that exist in the literature, resulting in different conceptual positions of vulnerability and different emphases on vulnerability, resilience, coping and adaptation (Smit and Wandel, 2006). Collectively, these may be regarded as different *entry points* into the understanding socio-ecological systems. From the perspective of this thesis, vulnerability constitutes the primary entry point and is conceptualised in Figure 2.1.

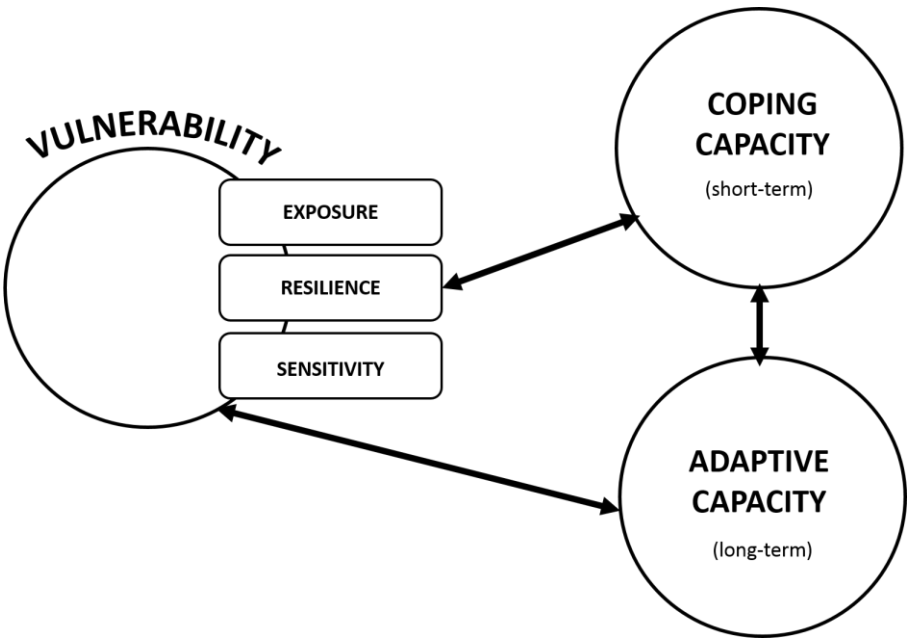


Figure 2.1: Conceptual framework for social vulnerability adopted in this thesis (adapted from Gallopín, 2006)

This research agrees with the dominant view in the literature that social vulnerability is composed of three component parts. ***Exposure*** refers to the likelihood of a particular hazard event occurring and is therefore interested in biophysical conditions *where these overlap with social systems* (e.g. occupancy of hazard locations). In some definitions, exposure is described as an external component of vulnerability (e.g. Bohle, 2001).

Sensitivity is a term typically described in the climate and environmental change literature, whereas *susceptibility* tends to feature in natural hazard studies. Generally speaking, *sensitivity* is defined in terms of the degree to which the system is modified and affected (e.g. Adger, 2006; Gallopín, 2006); whilst *susceptibility* is often referenced in terms of outcome only (i.e. degree to which a people are susceptible to harm or loss). Arguably, sensitivity is a more helpful term for emphasising the dynamic nature of vulnerability as a process and is therefore adopted here. Sensitivity concerns the inherent attributes of the population, which influence "*the extent to which a human or natural system can absorb impacts without suffering long-term harm or other significant state change*" (Adger, 2006).

Although adaptive capacity is often cited as the final component of vulnerability (Adger, 2006); here, ***resilience*** is denoted instead. This is defined as an internal component of vulnerability, referring to the ability of the social system to resist, adjust and adapt from the impact of a hazard event. Resilience can be considered a feature of ***coping capacity***, shaping short-term adjustments; and adaptive capacity, shaping long-term adaptations. Just as Adger et al. (2005) describe exposure, sensitivity and resilience as cornerstones for adaptation, Figure 2.1 also conceives ***adaptive capacity*** as influential to these three components of vulnerability. Activities such as new building codes or spatial planning, preparedness and mitigation, and improving access to resources (e.g. insurance), can reduce exposure and sensitivity, and heighten resilience, respectively (Adger et al., 2005). Therefore, whereas coping capacity is conceptualised as a distinct feature of resilience only, adaptive capacity is more broadly related to vulnerability (and its component parts) in general. In this model the arrows signify the two-way relationship that exists between these constructs; for example, where high adaptive capacity may lessen vulnerability, high vulnerability may reduce capacities to adapt.

In this thesis, social vulnerability is defined as a function of exposure, sensitivity and resilience of social systems, which influence the ability to resist, absorb, adjust and adapt from the

impact of a hazard event (or other forms of environmental perturbation). Vulnerability is also shaped by the adaptive capacity of the social system, to learn, evolve and implement adaptation strategies. The reviewed literature demonstrates the importance of conceptually establishing vulnerability within the context of these related concepts. However, in the context of this thesis, it is acknowledged that this definition constitutes an academic construction of vulnerability (and is in fact one of many constructions evidenced in the reviewed literature). Moreover, this definition may be at odds with how vulnerability is defined and experienced the people it affects. This tension between "outsider" and "insider" perspectives on vulnerability is further discussed in Section 2.4.

2.3.2 POSITIONING VULNERABILITY IN THE CONTEXT OF RISK

Vulnerability is also allied with discussions of risk via two central threads. The first, concerns how vulnerability is represented in relation to the hazard and integrated within assessments of risk. The second, concerns the study of risk perception and its influence upon the vulnerability of at-risk populations. Here, the chapter detours slightly and examines the psycho-social literature that may prove relevant for understanding constructions of vulnerability and informing research instruments (developed in Chapter 4).

2.3.2.1 RISK ASSESSMENT

Vulnerability is also integral to understandings of *risk*, though once again, the nature of this relationship is contested. The dominant conception of risk is that it is a function of the *likelihood* of an event occurring of a given magnitude, and the resulting *consequences* (Gouldby and Samuels, 2005). Risk is therefore understood in terms of the *hazard* and the *vulnerability* of receptors exposed to the hazard. Some authors further distinguish *exposure* in this risk equation (Fuchs, 2009). Exposure is often understood as the location of people (or another "receptor") within hazard boundaries and thus offers a partial, and physically-orientated measure of susceptibility to harm (Cardona, 2003). In practice, exposure and vulnerability are often combined in the assessment of *consequence*. Vulnerability is therefore represented as an "*integral part of the causal chain of risk"* (Kasperson et al., 2001).

Other authors have emphasised different conceptual frameworks. For instance, Cardona (2003) describes the convolution of vulnerability and hazard as internal and external components of risk, respectively. Sarewitz et al. (2003) identify *outcome risk* and *event risk*,

arguing that vulnerability is independent of the latter such that "*reduced vulnerability always means reduced outcome risk, but reducing the outcome risk does not always reduce vulnerability*" (p809). To illustrate this, the authors draw from the example of flood insurance and describe how raising insurance premiums effectively distributes outcome risk (i.e. cost), without requiring any reduction in vulnerability. Therefore, the authors emphasise the value of managing vulnerability its own right.

In this thesis, vulnerability is conceptualised as a component part of *risk* and is deemed crucial for understanding the distribution and nature of consequences resulting from a hazardous event (as argued by Kasperson and Kasperson, 2001). Moreover, as discussed in Chapter 1, it is argued that assessments of vulnerability are essential for delivering holistic Flood Risk Management (FRM). Therefore, whilst this thesis is vulnerability-orientated, insights from this research may contribute towards broader discussions of risk and FRM.

2.3.2.2 RISK PERCEPTION

Also relevant to understanding the relationship between risk and vulnerability, is the study of *risk perception*. Given current governance shifts in the UK (e.g. Defra, 2005; see Chapter 1), risk awareness is seen as crucial for empowering individuals, households and communities to adopt adaptive behaviours and thereby lessen their vulnerability to flooding. However, there is a long legacy of research documenting the disparities between objective 'expert' knowledge and subjective perceptions of risk amongst the public, which is seen as a significant barrier to the social acceptance of risk responsibility and the adoption of self-protective behaviours (Brown and Damery, 2002; Grothmann and Reusswig, 2006; Harries, 2008).

Some authors have focused on possible **communication barriers**, created through technical rhetoric and tools for communicating risk (e.g. flood maps). In this context, it is argued that there is a need for more socially-informed and tailored approaches to facilitate understanding of scientific knowledge (Brown and Damery, 2002; Haynes et al., 2008). Aside from the language and presentation of risk information, authors have drawn attention to the importance of *trust* associated with responsible agencies. Distrust is reported to not only affect risk perception, but also alters pathways for communication; such that reliance for information is placed upon informal social networks (Handmer, 2000; Haynes et al., 2008).

Cognitive and affect heuristics have been well documented. For example, the "*availability bias*" describes the assumption the future hazard events will mirror those encountered in the past (Tversky and Kahneman, 1974). Perceptions of risk are thus "anchored" in previous experience and become *normalised* (Mileti and O'Brien, 1993; Keller et al., 2006; Haynes et al., 2008). Beyond the 'availability' of memories, Slovic et al. (2004) argue that events associated with emotional experiences (i.e. negative affect), are more readily recalled and increase perceptions of risk. Evidence for the "*affect heuristic*" has been widely documented in research (Weinstein et al., 2000; Keller et al., 2006). Research has also shown how risk can be *transferred* in the context of perceived technological 'solutions', or "levee bias", may create a false sense of security (Haynes et al., 2008; Steinführer et al., 2009). Related to this, there is empirical evidence for an "*optimistic bias*", which leads individuals to under-estimate their risk in the context of others (Weinstein, 1983; McIvor and Paton, 2007).

This has important implications for vulnerability and the adoption of precautionary behaviours (Weinstein and Lyon, 1999). For instance, the feeling that there is nothing that can be done to prevent flooding, is sometimes referred to in psychology as '*learned helplessness'* (Fernandez-Bilbao and Twigger-Ross, 2009). On this point, Harries (2008) explains how seemingly irrational and maladaptive behaviours to flooding, reflect strategies to reduce anxiety and preserve *ontological security*, rather than strategies to reduce risk itself (Giddens, 1991). In the context of this study, these emotional responses may be important for understanding residents' constructions of vulnerability.

Social norms and values are also addressed in the literature (Douglas and Wildavsky, 1983; Oliver-Smith, 1996; Haynes et al., 2008). McIvor and Paton (2007) emphasise the influential role played by social norms in informing hazard perceptions and preparedness decisions. These authors argue that such decisions are partially governed by normative comparisons towards a "significant other" (e.g. spouse, parent and peer groups); i.e. an action or behaviour that is viewed favourably by significant others, is more likely to be adopted. In addition, Poumadére et al. (2005) reveal that heat-wave risk is rejected in the face of established norms of who constitutes a vulnerable person. This latter finding indicates the important role played by social norms in shaping constructions of 'vulnerable' people, and corresponding evaluations of personal vulnerability and risk. In the context of flood hazard, Moran-Ellis et al. (2006) also suggest that people's appraisals of personal vulnerability are to some extent moulded through socio-cultural frames for understanding. These findings are highlighted here for further exploration in this thesis.

Dispositional characteristics have also emerged as relevant. For instance, optimism has been shown to dampen threat appraisals (e.g. Jerusalem, 1993), yet has also been positively associated with health care and attentiveness towards risk information (Trope and Neter, 1994; Aspinwall and McNamara, 2005). Indeed, Aspinwall and Brunhart (1996) report that participants who were less worried about their personal vulnerability to skin cancer were more likely to be attentive to risk information. In contrast, others have concluded that high levels of optimism and perceived control can heighten an individual's vulnerability; for instance, Scheier et al. (1986) demonstrated that such individuals were less likely to adopt health precautions. Aspinwall and Taylor (1997) suggest that predispositions towards favourable (e.g. optimistic) appraisals may regulate negative emotions, enhance information processing and structuring of the problem at hand. Equally unfavourable appraisals (e.g. pessimism) can reduce attention or cause distortion of information (e.g. denial). Whilst this body of research has furnished somewhat contradictory findings, nonetheless, it is apparent that tendencies towards positive or negative appraisals are relevant for understanding individual differences in perceptions of risk.

Studies have also examined the *perceived control* of the event or threat in question and the notion of locus of control (introduced by Rotter 1982). Whereas those with an internal locus of control adopt the belief that their destinies are within their control (i.e. self-determined); those with an external locus of control attribute an external power, someone else or higher entity as responsible for their actions (e.g. God or fate). McClure et al., (1999) demonstrated that "internals" were more likely to adopt preparedness behaviours, compared to their "external" counterparts. Moreover, internal-external orientation seems to have implications for assigning blame and attributing the occurrence of disaster towards the government or chance alone (McClure, 2006). Current research in the UK is also examining the locus of control profile of the population and seeking to examine associations with adaptive behaviours, alongside implications for tailoring risk communication (Rose et al., 2012).

Further evidence indicates the importance of understanding the **characteristics of the hazard** itself ("hazard etiology"). In terms of origin, there is evidence to suggest that technological or human-induced hazards are regarded as unbounded, 'invisible' and therefore more threatening than 'natural' hazards (Harries, 2008). In contrast, Sjöberg (1998) distinguishes between *emotional* and *cognitive* types of risk, evoking different response mechanisms; for

example, a thunderstorm as a sensory-threatening risk, evokes an emotional reaction and can therefore be defined as an *emotional risk*. Similarly, Steinführer et al. (2009) suggest that hazard characteristics may influence constructions and experiences of *ontological vulnerability* amongst those exposed to risk. In addition, the timing between flood events has also proved influential. Whereas long time intervals between events can reduce views of likelihood (Robertson, 2005); recent and more memorable events are deemed more likely to occur (i.e. 'availability heuristic', Tvsersky and Kahneman, 1974).

The **saliency of risk** in the context of daily life is also influential. For example, Paton et al. (2001) demonstrate that risk perception was not steered by the volcanic activity *per se*, but by the relationship between the hazard and people's personal circumstances (e.g. impact to their income). McIvor and Paton (2007) further stress that, whilst people may adopt positive attitudes toward precautionary behaviours and hazard preparedness, motivation to adopt these actions is determined by the salience of hazard risk in relation to other risks encountered in daily life (e.g. health risks). Vulnerability research has similarly advocated the need to re-contextualise and understand natural hazards not as extreme events, but within the structures of "*the ordinary and the everyday*" (Fordham, 1998: 140).

Recurring within this literature is the influence of **previous flood experience** in shaping household perceptions of risk (Grothmann and Reusswig, 2006; Burningham et al., 2008; Parker et al., 2009; Rose et al., 2012). Studies have shown how experience can lead to higher estimates of risk and motivate precautionary behaviour (Keller et al., 2006; Siegrist and Gutscher, 2008). On this matter, there is a vast body of literature examining perceptions of risk in the context of **adaptive or maladaptive decision making** (Lindell and Perry, 2000; Grothmann and Patt, 2005; Grothmann and Reusswig, 2006; Harries, 2008; Wolf et al., 2010). It is argued that appraisals of personal capabilities and coping (i.e. self-efficacy) are triggered by appraisals of risk; '[a] *minimum level of concern must exist before people start contemplating the benefits of possible actions and ruminate their competence to actually perform them*' (Schwarzer, 1992, p235). For this thesis, it seems that self-efficacy and coping may be relevant to understanding people's constructions of their personal vulnerability, which is likely to be triggered and partially-driven by constructions of risk according to this literature. Therefore, these findings are highlighted here for investigation and contribute to the design of research instruments employed in this study (discussed in Chapter 4).

"Perception" Vs. "construction" of risk

A final note must be made on the use of language. Although "*perception*" is firmly established, some authors observe the misleading nature of this term. Kuhlicke and Steinführer (2010) argue that the mental construct of risk (probability multiplied by consequence) cannot be *perceived* in the same way that human senses react to external stimuli (Wachinger and Renn, 2010). Moreover, there is a vast body of research documenting how risk is *constructed* through social norms and values, cultures and experience to name a few, which dynamically influence the way in which risk is defined and experienced, amplified and attenuated (Kasperson et al., 1988; Kuhlicke and Steinführer, 2010). Despite this acknowledgement, authors continue to uncritically use the term perception. In contrast, this thesis explicitly refers to *constructions* of risk and vulnerability to emphasise the active nature of these processes (and 'perception' will only be used when describing the reviewed literature). Also observed in the literature is the tendency for some authors to substitute the term 'risk' and 'hazard' interchangeably. To avoid the confusion that this creates, *risk* and *hazard* are applied in this thesis according to the definitions outlined in the glossary.

To date, research has largely focused on accounting for observed differences between scientific, professional and public understanding of *risk*; however, this parallels a similar debate concerning *vulnerability*, which is the pivotal focus of this thesis. In taking these insights forward, it is clear that risk 'perception' is highly relevant to understanding constructions of vulnerability. Not only does it appear to be a trigger for coping appraisals (relevant to vulnerability; Figure 2.2), but established norms used to identify vulnerable individuals may also lessen views of personal vulnerability and risk (Poumadére et al., 2005). The literature also reveals a number of cognitive and emotional variables which may similarly shape evaluations of vulnerability.

2.3.3 CONCLUSIONS

Within the literature there appears to be a progressive trend towards integrated thinking and cross-over between different fields of research (development, climate/environmental change, natural hazards and disasters). This section has reviewed the contested intellectual space of vulnerability research, as articulated through these different disciplinary and theoretical perspectives. It has been argued that attached to discussions of vulnerability are the constructs of resilience, coping, adaptive capacity and risk. Moreover, these concepts may be

regarded as equally relevant and simply providing different *entry points* for understanding social-environmental interactions at multiple spatial and temporal scale.

Here, vulnerability is defined as a function of exposure, sensitivity and resilience of social systems, which influence the ability to resist, absorb, adjust and adapt from the impact of a hazard event. Vulnerability can also be understood as an integral component of risk and essential for understanding the distribution and nature of consequences resulting from a hazardous event. Also potentially relevant to this research, is the study of risk perception. A number of variables are identified in the literature, such as the role of social norms, emotions, hazard etiology, and cognitive and emotive processes, which may also prove important for understanding residents' "constructions" of vulnerability. Moreover, the term "*construction"* is identified as a more appropriate term for conducting future discussions.

It is acknowledged that the presented definition of vulnerability, reflects an academic construction of vulnerability, which is not only at odds with other interpretations in academia, but may also conflict with the views of those potentially experiencing vulnerability. Arguably some form of conceptual framework is warranted to fully explore and account for the different types of constructions and multitude of interpretations.

2.4 A CONCEPTUAL FRAMEWORK FOR UNDERSTANDING VULNERABILITY RESEARCH: THE ETIC-EMIC SPECTRUM

To address the need for conceptual clarity, this chapter looks to the literature in psychology and anthropology and draws from the etic-emic (outsider-insider) debate, which has a long legacy in these disciplines. These terms are defined here in Box 2.1. The etic-emic distinction pivots around two central debates; namely the extent to which scientific methods can capture social experiences and the extent to which these methods and concepts can be transferred across populations and cultures (Peterson and Hunt, 1997). Therefore, pivotal to the etic-emic debate are epistemological and methodological decisions made by the researcher. These discussions have filtered into a broad range of research fields, such as folklore (Dundes, 1962), psychiatry (Patel and Mann, 1997; Algeria et al., 2004), marketing and communication (Raaij, 1997), social justice (Sabbagh and Golden, 2007), participatory action research (Young, 2005) and nursing (Spiers, 2000).

Whilst some have presented a thesis of incompatibility and tension between the two positions (Helfrich, 1999); others have highlighted the gradient or continuum upon which etic and emic orientated research exists and the complementary nature of these seemingly opposing perspectives (Berry, 1989, 1999; Morris et al., 1999). Nonetheless, there is an overarching common thread which recognises the need for some form of terminology that acknowledges and distinguishes between these two central research perspectives (Berry, 1989).

Although the etic-emic distinction has been widely discussed in other disciplines, it has only recently filtered into the field of natural hazards and applied to the study of flood vulnerability (Moran-Ellis et al., 2006; Fielding and Fielding, 2008). Building upon this earlier research, this chapter now examines the concept of vulnerability through the lens of etic-emic thinking and examines the benefits of applying these terms to bring some clarity to vulnerability research in natural hazards. To-date, there has been little effort to conceptualise how existing research is positioned across the etic-emic gradient, or to examine the extent to which these different orientations result in different constructions of vulnerability. This chapter is therefore a first step in this direction.

BOX 2.1: Etic and emic distinctions

Etic – *(adj.use)* in which studied phenomenon are examined from the perspective of the neutral and objective "outsider". Units of analysis are predetermined by the observer, based on the underlying assumption of a single, universal reality.

Emic – *(adj. use)* in which studied phenomenon are examined from the perspective of the "insider". Units of analysis are discovered during the research process and not predetermined but emergent from interaction between the researcher and research participants. The researcher seeks to understand the significance of concepts and how they are understood and experienced within a given context; whilst recognising their own positionality within the research process.

2.4.1 LESSONS FROM PIKE'S THESIS ON ETICS AND EMICS

Etic and emic thinking originated in behavioural linguistics and was introduced by Pike's work on "*Language in relation to a unified theory of the structure of human behaviour*" (1967). Essentially, Pike sought to apply units adapted from linguistics to the analysis of human behaviour, coining the phrases of etic and emic from *phonetic* and *phonemic* (see reviews in Berry, 1999; Harris, 1976). Whereas sounds in language are defined in phonetics through the taxonomy of body parts required in speech production (e.g. voiced and unvoiced sounds are

dependent on the activity of the vocal cords); in phonemics, sounds in language are based on the '*implicit or unconscious system of sound contrasts internally held by native speakers, which are employed to identify meaningful utterances in language'* (Harris, 1976). Phonetics is thus the study of universal sounds, while phonemics is a study into meaningful sounds (Morris, 1999; Helfrich, 1999). The quote below highlights a number of distinguishing features between etic and emic perspectives, and these are also summarised in Table 2.1.

> "An emic approach must deal with particular events as parts of larger wholes to which they are related and from which they obtain their ultimate significance, whereas an etic approach may abstract events, for particular purposes, from their context or local system of events, in order to group them on a world-wide scale without essential reference to the structure of any one language or culture." (Pike, 1954: 10)

Table 2.1: Assumptions of etic and emic perspectives and associated methods (informed by Berry, 1989: Morris et al., 1999)

Features	**Emic ("inside") perspective**	**Etic ("outside") perspective**
Assumptions	▪ Studied phenomenon as seen from the perspective of "insider" ▪ Units of study are discovered during analysis ▪ Relative assessment ▪ Context-specific	▪ Studied phenomenon as seen from the perspective of "outsider" ▪ Units of study and classification of studied phenomenon are predetermined ▪ Absolute assessment ▪ Context independent
Typical features of methods associated with this perspective	Qualitative research methods that avoid imposing constructs belonging to the researcher. Typically small sample size and focused case study for context-rich data. E.g. ethnographic studies, in-depth interviews, content analysis.	Quantitative research methods that facilitate comparisons across people and place. Research instruments designed from external constructs held by the researcher. E.g. questionnaire survey and statistical analysis.

Pike's vision is somewhat contested. On one hand, it seems apparent that etic and emic distinctions are regarded with equal importance as Pike asserts that the two "*do not constitute a rigid dichotomy of data, but often present the same data from two points of view*' (Pike, 1967: 41). However, additional statements form the impression that Pike conceived the emic perspective in a position of supremacy, whereby the etic is acknowledged as "*an essential initial approach to an alien system*" (p37). Moreover, Pike states that analysis through etic and

emic lenses results in "*tri-dimensional understanding of human behaviour instead of a 'flat' etic one*" (p41). These apparent contradictions have divided authors' interpretations of Pike's philosophical orientation and resulted in different theoretical understandings of the etic-emic distinction; and thus has implications for the design and application of the conceptual model presented in this chapter.

A symbiotic conceptualisation of these perspectives is widely presented in the literature and strongly voiced by Berry (1989;1999) in the study of cross-cultural psychology; "*We cannot be 'cultural' without some notion like emic; and we cannot be 'cross' without some notion like etic"*. In arguing the symbiotic nature of this partnership, Berry proposes a 3-step procedure for guiding research (presented in Table 2.2). The process is described as "*dynamic, sequential and continuous, in which arrival at the third goal becomes the starting point for the next phase of research on a particular topic*" (Berry, 1999). These steps highlight the potential for mutually-informative research methods and resulting knowledge.

Table 2.2: From imposed to derived etic research: The 3-step procedure proposed by Berry (1969, 1989, 1999)

Methodological steps for conducting symbiotic research	Description
STEP 1 – "Imposed etic"	Beginning with an intra-cultural study into one's own culture. Attempts to apply concepts or research instruments (in themselves, emic constructs rooted in the researcher's culture) into an unknown culture, constitutes an etic application; this is referred to as an ***imposed etic*** perspective. Knowledge is transported and tested in another cultural setting.
STEP 2 – "Emic"	Immersion in a new culture can be obtained through ethnographic fieldwork to gain familiarity and valid knowledge that is expressed in local cultural terms. Findings can be compared to previous stage.
STEP 3 – "Derived etic"	Knowledge that is unique to a particular culture is regarded as emic; whereas knowledge that is also observed in other cultures can be regarded as etic. Comparison is possible for these shared features, only. This is referred to as a ***derived etic*** perspective. This can inform methods for cultural comparison (though limited to the set of cultures for which it has been established), towards establishment of universality and pan-human validity.

In the context of cross-cultural psychology, a recurring criticism has centred on the use of standardised assessment instruments and ethnocentric construction in western societies (i.e.

akin to Berry's notion of an *imposed etic* perspective). In response, there are a number of studies that examine cultural equivalences and adaptations required to adjust such etic instruments in culturally-sensitive ways. For instance, Algeria et al. (2004) employ focus groups and in-depth interviews (i.e. emic-orientated methods) to elicit local cultural knowledge and inform adjustments to a cross-cultural psychiatric assessment instrument. The authors argue that the main challenge in instrument development is in "striking a balance" between seeking cultural equivalences, whilst maintaining comparability across cultures, for emic and etic insights respectively.

It is apparent from Berry's discussion, that etic and emic positions can be discussed in several contexts, which Berry refers to as a "tripartite distinction";

1. Theories (concepts)
2. Methods
3. Realities (i.e. object of investigation)

These are important epistemic points relating to the positionality of the researcher. For instance, the orientation of the researcher towards the process of enquiry (i.e. epistemology) is manifest in the choice of theories, methods and the object of investigation. The final distinction made by Berry, "realities", essentially refers to resulting knowledge; where universal cultural attributes are referred to as etic, compared to cultural-specific attributes which are defined as emic (Earley and Randel. 1995; Karasawa, 2002; Algeria et al., 2004). This latter assertion is contested by Harris (1976) and others, who argue that knowledge elicited via emic methods remains emic, whether or not it is observed elsewhere. Whilst Berry acknowledges the potential for confusion and the importance of keeping these distinctions in mind, he also remarks that the "*context usually suffices*" and does not explicitly identify points 1-3 to above in his discussions. Other papers similarly lack this clarity and it is not uncommon to see the terms 'etic' and 'emic' switch interchangeably between discussions of epistemology, methods and even resulting knowledge, and applied as nouns, adverbs and adjectives. In this thesis, a conceptual model is presented to make explicit these distinctions, and avoid the potential confusion for the reader (Section 2.4.3).

In contrast, some authors have interpreted the etic-emic distinction as a source of tension. For instance, Helfrich (1999) seeks to resolve this by proposing an integrative methodological

framework for studying cultural variability ("*triarchiac resonance principle*"), which takes advantage of the strengths, whilst minimising the weaknesses of etic and emic approaches (Helfrich, 1999). Other tensions seem to arise in response to interpretations of Pike's original work. For instance, Harris (1976) remarks how Pike conceives etic research as "*necessary evils, mere stepping stones to higher emic realms*" (p333). In the context of cultural materialism, Harris argues that the goal is to account for the divergence and convergence of both etic and emic structures, rather than the conversion of one to the other.

There is an underlying debate in this literature, concerning the attachment of etic-emic perspectives to epistemology and whether the two are in fact akin; however, few authors explicit debate this. Harris (1976) posits that the etic-emic distinction is fundamentally an epistemological one, but rejects notions of superiority and instead asserts the following;

> "Once again, however, let me categorically reject any notion of superior and inferior realities associated with emic and etic epistemological options. Everything that we human beings experience or do is real. But everything we experience or do is not equally effective for explaining why we experience what we experience and do what we do" (Harris, 1976)

This statement by Harris, effectively describes the meta-view adopted in thesis, which straddles the etic-emic debate and equally does not assume the supremacy of one perspective over the other; but instead, consciously reflects on the valuable gradient between the two for understanding flood vulnerability. Overall, it is evident from the literature that the etic-emic distinction cannot be divorced from views on reality, or methods used to elicit this reality. In Harris's operational definition of these terms, the status of the researcher and the researched is essential in the objective versus subjective discovery of knowledge, respectively. In response to Helfrich (1999), Lonner (1999) expresses a degree of fatigue with the "*on-going and tenacious etic-emic debate*" and contends that this argument has thrived within psychology under various theoretical guises; including the objective-subjective debate from universalists and relativists. Lonner articulates that "e*mics and etics are nothing more, and nothing less, than orienting, and indeed 'resonating', concepts that help us cut paths through various methodological and conceptual jungles"*.

One might question whether the etic-emic debate is exhausted or the value of continuing this debate still further. However, it is argued here that these terms could be applied in the natural hazard context, if, and only if, efforts are made to fully articulate their meaning and contexts in

which they can be applied. Ultimately it seems that the etic-emic distinction is applicable on several levels; namely representing *epistemology, methods* and resulting *constructions of knowledge* (a point returned to in Section 2.4.3). Whilst this debate dominantly focuses on the positionality of the researcher (i.e. researchers are orientated to etic or emic positions); something not fully explored is the affect of research participants who clearly influence resulting constructions of academic knowledge. This is alluded to by Harris (1976) who remarks, "*Depending on whose categories establish the framework of discourse, informants may provide either etic or emic descriptions of the events they have observed or participated in*". The extent to which participants themselves can be regarded as insiders and outsiders, and also aligned to etic and emic positions is examined in the next section.

2.4.2 THE CHALLENGE OF IDENTIFYING "INSIDERS" FOR EMIC-ORIENTATED RESEARCH

Arguably, all forms of academic knowledge, whether derivative of emic methodologies or not, ultimately constitute etic constructions; i.e. resulting knowledge represents the researcher's interpretation. This might be alternatively phrased in another light where etic knowledge is in fact regarded as the emic insight of the researcher (Levi-Strauss, 1974; in Harris, 1976). To some extent the researcher can always be cast as an outsider; however, the purpose of emic methodologies is to re-orientate the researcher according to insider frames of understanding. The extent to which the researcher engages with such methodologies, thus determines their degree of 'outsideness'. This distinction is further clouded when one acknowledges the multiple identities of the researcher, both as an academic and as a person. But it is not only the positionality of the researcher that matters in this discussion. Emic-orientated research necessitates the identification of "insiders", who are assumed to be those closest to the issue at hand and able to offer insights into the *lived experience* of the studied phenomenon. However there are a number of variables which influence the level to which an issue penetrates a supposedly homogeneous group of insiders.

These challenges are reflected upon in Young (2005) in the context of *Participatory Action Research* (PAR). In this paper, Young reflects upon the multiple and overlapping positionalities of herself and of research participants. In this discussion, construction of self-identity is acknowledged as fluid and potentially contestable from the perspective of others. Whilst PAR tends to assume the identity of 'insiders' by "*dint of personal experience*", Young's discussion highlights the "slippery" nature of this assumption. Young illustrates the challenge of

determining those 'closest' to the research problem using the example research question of "*why do so few people from X access higher education*?" In this example, she notes that welfare workers (outsiders) were once university residents (insiders) and thus carry multiple identities.

For the purpose of this thesis, this concept is re-drawn in Figure 2.2, which outlines the range of groups that might be consulted to address the following hypothetical research question: "*who is the most vulnerable to flooding?*" It is assumed that "insiders" will be able to offer a more thorough answer to this question, based on their personal experiences and "insider" knowledge, not necessarily apparent to "outsiders". As illustrated, different groups of potential participants vary in their *conceptual* proximity or distance to the topic under investigation. The emphasis on "conceptual" distances is key. Especially in the context of flooding, it is important to isolate the insider-outsider debate from the *physical* distance created by flood boundaries; i.e. it is not necessarily the case that those located within these boundaries are "insiders". Conceptual proximity can be determined by the researcher, who may be informed through 'insider' experience, or more distantly informed through immersion in relevant literature; or through interaction with groups participating in the research. In this context, proximity can be essentially informed objectively or subjectively.

Young asserts the need to be "*analytically aware of how to work across boundaries of experience and knowledge*" and acknowledge the potential for overlapping personae. For instance, professional groups may have personal experiences as a resident of an area prone to flooding. Furthermore, residents themselves may have multiple identities with flooding, based on experiences within or between places of residence. This discussion highlights the heterogeneity of those collectively identified as "insiders" and "outsiders", and the potential for significantly different perspectives to the research question.

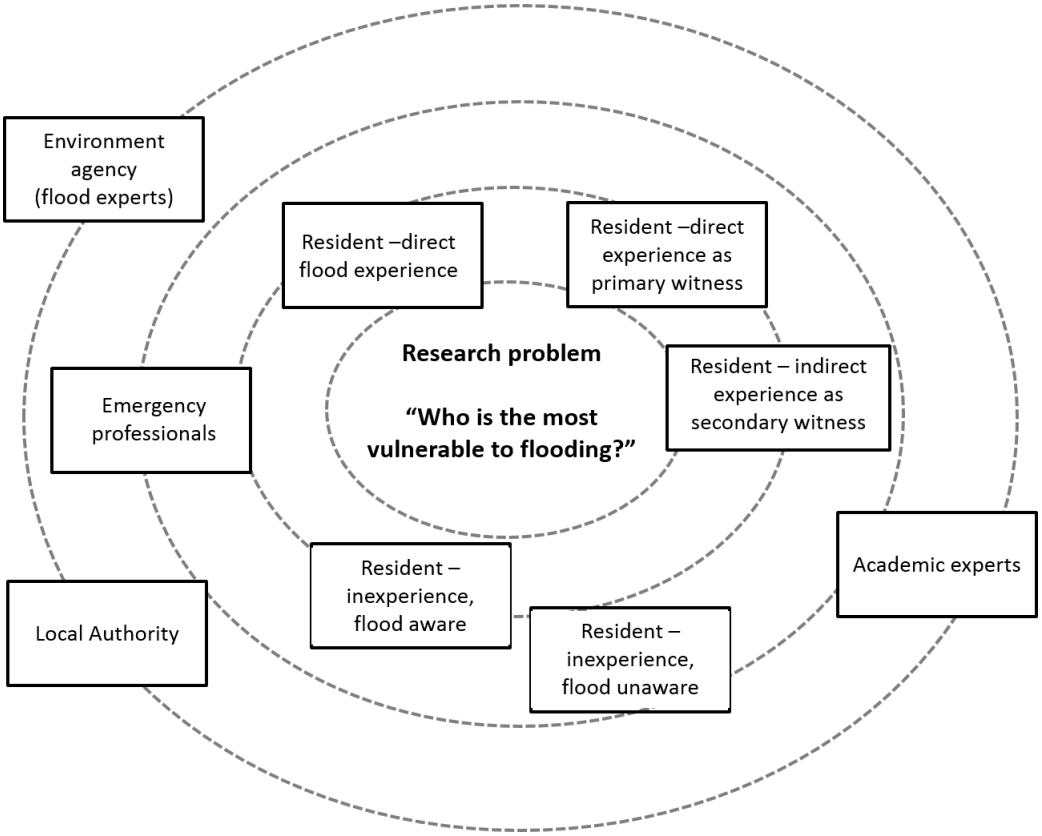


Figure 2.2: The challenge of identifying those closest to the research problem ("insiders"), using the example research question "who is the most vulnerable to flooding?" Groups touching the inner circle are represented as potential insiders. Moreover, these groups may not be mutually exclusive. Source: Personal development, inspired by Young (2005)

This discussion highlights the difficulty of defining insider-outsider boundaries and the need to critically examine the positionality, not only of the researcher but of the research participants themselves. Given the epistemic roots of the term 'positionality' in the context of researcher-participant relations, it is perhaps inappropriate to adopt this term when speaking about the participants themselves. Instead, it may be more helpful to consider the notion of "***insiderness***" and acknowledge that participants' conceptual proximity or distance to the topic under study may vary across this gradient. In the context of flood research specifically, this is pertinent given recent shifts towards participatory communication and integration of different forms of expertise (Brown and Dammery, 2002). There is a need for research to be critically aware of whose expertise and whose reality is captured, examining how knowledge is constructed and accounting for similarities and differences across researched groups. To-date, research has largely focused on contrasting socio-demographic groups or those with or without previous flood experience, and has not considered the influence of *insiderness* (and potentially multiple variables shaping this), upon constructions of vulnerability. This is a central

theme identified for study in this thesis and addresses the wider aim of this research to examine constructions of vulnerability across the etic-emic gradient (Chapter 1; also see Section 2.8).

2.4.3 A CONCEPTUAL MODEL TO OUTLINE THE ETIC-EMIC DISTINCTION IN RESEARCH

From the reviewed literature it seems that etic-emic debate is dominantly manifest on three levels concerning the research process; from the starting **epistemological position** and selected research **methods**, to the resulting **construction of knowledge** (i.e. the outcome of the research). Each of these three levels may be orientated towards the outsider (etic) or insider (emic) perspective. It is also clear in the literature that these perspectives cannot be conceptualised in binary, polarised terms. To address and clarify this, Figure 2.3 presents a conceptual model to outline the etic-emic distinction in terms of vulnerability research.

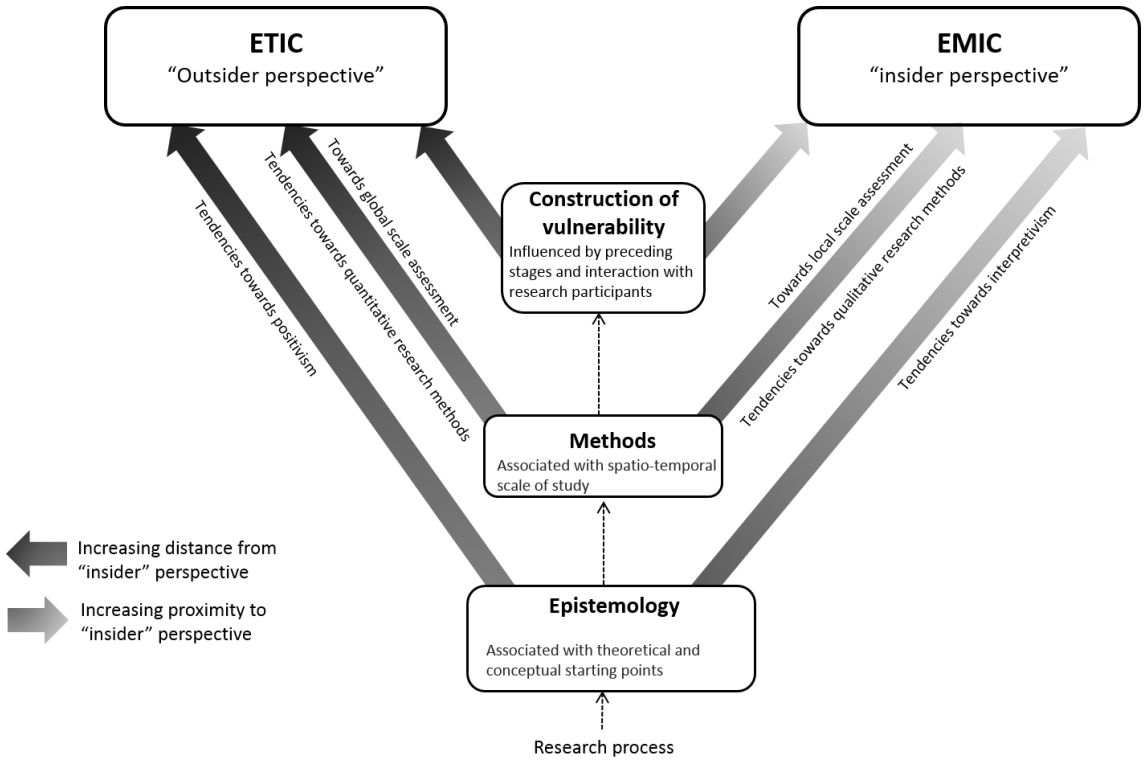


Figure 2.3: A conceptual model to outline the etic-emic distinction, between epistemology, methods and resulting construction of vulnerability

The etic-emic gradient of epistemology

Epistemology is the first starting point in this conceptual model and concerns the researcher's orientation towards the nature of knowledge (e.g. positivism, critical realism, constructivism etc.). Scientists from a positivist standpoint are more likely to uphold a *realist* view and belief in objective, context-independent truth. At the other end of this spectrum, constructivists and interpretivists adopt a *relativist* view and belief in multiple constructions of reality, necessitating the need to orientate knowledge towards "insider" perspectives. However, there are clearly gradients in research and moderated epistemologies which blur this distinction.

Berry (1989; 1999) similarly argues that the etic-emic orientation of the researcher becomes evident in the choice of theories and concepts for study. These theoretical and conceptual starting points identify the object of the investigation, while methods seek to measure it. Fielding and Moran-Ellis (2006) also suggest that there can be etic and emic research questions. Indeed, it could be argued that certain research topics are predisposed to etic-emic orientations; for instance, studies examining global patterns of vulnerability are invariably distanced from emic perspectives and require some form of objective, transferable method to compare people and place. Therefore, as suggested in Figure 2.4, the spatio-temporal scale at which research topics are addressed is connected to this discussion. The review of vulnerability literature presented in this chapter will demonstrate how etic and emic-inclined research cluster at global to subnational, and local scales of study respectively. Clearly, the topic selected, the scale at which it is to be addressed (and the practicalities associated with this), inform the selection of appropriate research methods.

The etic-emic gradient of research methods

Research methods are naturally aligned to etic and emic ends of this spectrum. Whereas quantitative methods are conventionally linked to objective, positivism; qualitative methods can facilitate exploration into multiple realities and subjective interpretivism pursuits. However, this distinction can be somewhat fuzzy (Morris et al., 1999; Burningham et al., 2008). To some extent it is possible to elicit emic perspectives from etic approaches; for instance, risk-awareness surveys can capture insider constructions of risk but also enable large sample sizes and statistical analysis of emic findings (Fielding and Fielding, 2008). In contrast, qualitative data may support etic-orientated research (Section 2.5). Fielding and Moran-Ellis (2006) argue that the etic-emic distinction should in fact be conceived as an alternative to the quantitative-

qualitative paradigm wars in social research, asserting that the "*emphasis on data as numbers and texts obscures the differing perspectives*" (discussed further in Chapter 4). Ultimately, it is argued here that the distinction between etic or emic methods must be based on the underlying justifications steering the use of a particular method; thus methods may be defined as etic when applied to etic-orientated research and vice versa.

The etic-emic gradient of constructed knowledge

Research ultimately aims to produce new knowledge. As mentioned in the introduction to this chapter, knowledge can be regarded as a construction of reality, such that multiple constructions of the studied phenomena (in this case, vulnerability) may exist. Resulting **constructions of vulnerability** emerge through the etic-emic orientations of the preceding stages of the research process and may be aligned to this etic-emic spectrum. Figure 2.4 deliberately avoids 'mapping' these constructions onto this intellectual space at this stage; instead, this will emerge from the subsequent analysis of the literature. Another aspect to consider, is the influence of research participants themselves (as discussed in the previous section).

In contrast to the conceptions evident in cross-cultural psychology, where unique and shared knowledge is regarded as emic and etic respectively; this thesis accords to Harris's assertion that knowledge elicited via emic methods remains emic, whether or not it is observed elsewhere. However, in disagreement with Harris it is argued here that emic knowledge can inform etic-orientated research (e.g. integrated into etic research instruments; akin to Berry's notion of *derived etics*). This is fully explored in the next section in the context of indicator research.

Applying the etic-emic conceptual framework

The rest of this chapter applies this conceptual model to the analysis of existing vulnerability research in the context of natural hazards and disasters. Whilst this model acknowledges a gradient between etic- and emic-orientated research, for purpose of discussion this gradient is divided into four parts to distinguish between research that is *informed* by etic or emic perspectives, from research that adopts a more "true" etic or emic standpoint. The extent to which research could ever be truly one or the other is clearly debateable; however for the purpose of this discussion these categories identify research which is more strongly orientated towards the etic-emic extremes. For instance, etic research might include indicator studies

derived from statistical techniques (e.g. factor analysis), without consultation to insider knowledge (e.g. Eakin and Bojorquez-Tapia, 2008). On the other hand, emic research may include ethnographic or participatory techniques, whereby the researcher has made considerable effort to immerse the research in the research context and insider constructions (e.g. Heijmans, 2004). The four categories to which the vulnerability research is reviewed in this chapter (and corresponding constructions of vulnerability) are illustrated in Figure 2.4 and include: *etic, informed-etic, informed-emic* and *emic* perspectives. These are examined sequentially in Sections 2.5 and 2.6, and aligned to the etic-emic spectrum in Section 2.7. Attention is given to how vulnerability is theoretically and conceptually approached, the methods employed and the resulting constructions of vulnerability.

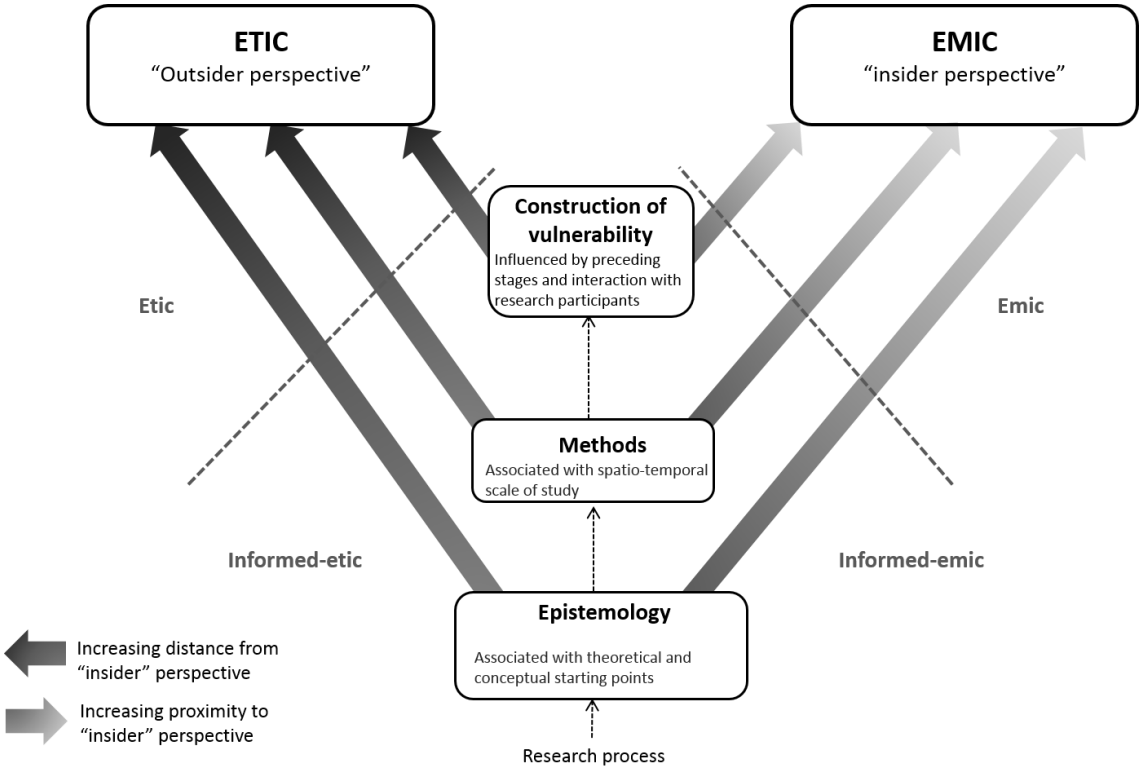


Figure 2.4: Categorising the etic-emic distinction between etic, informed etic, informed emic and emic orientations

2.5 ETIC & INFORMED-ETIC CONSTRUCTIONS OF VULNERABILITY

Etic-orientated research studies vulnerability from the perspective of a neutral and objective "outsider" and therefore employ methods which retain a measured distance between the researcher and research participants. Typically, this research adopts **indicator and index-based**

analyses (Tapsell et al., 2002; Cutter et al., 2003; Birkmann, 2006). However, there are subtleties in the methods employed to identify and aggregate such indicators; indeed, whilst some authors rely purely on statistical methods of deduction (Rygel et al., 2006; Peduzzi et al., 2009), others draw from expert consultation to *inform* this otherwise etic approach (Tapsell et al., 2002; Dwyer et al., 2004).

The Hyogo Framework for Action (HFA; Chapter 1) stresses the need to address vulnerability through the use of indicators for social, economic and environmental conditions, and emphasise the value of these instruments as tools to support decision making (UN/ISDR, 2005). Birkmann (2006) argues that social vulnerability cannot be directly observed or measured and is therefore reliant upon proxy indicators, defining these as "*an operational representation of a characteristic or quality of a system able to provide information regarding the susceptibility, coping capacity and resilience of an element at risk to an impact of an […] event linked with a hazard"* (p 57).

Socio-demographic factors are recurring indicators cited in the literature. To name a few, these include age (Cutter et al., 2003); gender (Enarson and Morrow, 1998); race and ethnicity (Elder et al., 2007); and income (Masozera et al., 2006). Such indices offer an opportunity to record, monitor and compare degrees of social vulnerability between people and place. However, the method of aggregating these proxy variables into a single measure of vulnerability (i.e. an index) remains contentious. This uncertainty has created a tendency to develop simple additive models which treat all proxy indicators with equal importance (Tapsell et al., 2002; Cutter et al., 2003). Whilst this seeks to minimise subjectivity and offers a solution in the absence of a *defensible weighting scheme* (Cutter et al., 2003), this approach circumvents this uncertainty. More recently, a number of studies have sought to proactively overcome this and explore alternative strategies for aggregation; such as Pareto ranking (Rygel et al., 2006), multi-criteria decision analysis and fuzzy logic (Eakin and Bojorquez-Tapia, 2008).

For example, Eakin and Bojorquez-Tapia (2008) propose a strategy for constructing a vulnerability index based on multi-criteria decision analysis (MCDA), employing proxy indicators identified through the climate change literature. Analytical Hierarchical Process (AHP) is the MCDA method applied to determine the weights for these indicators, and operates on the basis of evaluating and ranking alternatives (Eakin and Bojorquez-Tapia, 2008). This coupled-method allows households to have a *degree of membership* to each vulnerability

class (i.e. high, medium or low) and therefore reveals the complex structure of household vulnerability. Whilst the selection of indicators is rooted in the literature, ultimately its goal is to mathematically assign a weighting scheme to bypass the subjectivity of the researcher; thus, both the method and resulting research output (i.e. index) are firmly orientated towards the etic standpoint.

In contrast, there are some examples in the literature where methods for selecting or aggregating indicators is *informed* through consultation with 'experts' (i.e. other academics in the field). This expert-system approach was employed by Tapsell et al. (2002) to identify the indicators used in the development of the **Social Flood Vulnerability Index** (**SFVI).** The SFVI represents an aggregated, equal-weighted index based on an additive model of the four indicators listed in Table 2.3 and provides a final metric for *relative* vulnerability in England and Wales. This index was used by the UK Environment Agency as a means of identifying socially vulnerable areas more sensitive to the adverse impacts generated from flood events and formally included within Catchment Flood Management Plans (Twigger-Ross and Scrase, 2006).

Table 2.3: The Social Flood Vulnerability Index (Tapsell et al., 2002)

INDICATOR	MEASURE
Townsend Index for Deprivation:	
Unemployment	Unemployed residents 16yrs and over, as a percentage of all economically active residents
Overcrowding	Households with more than one person per room, as a percentage of all households
No car ownership	Households with no car as a percentage of all households
Non-home ownership	Households not owning their own home as a percentage of all households
75 years +	Residents aged 75years and over as a percentage of all residents
Lone parent households	Lone parents as a percentage of all residents
Long-term illness	Residents suffering from a limiting long-term illness, as a percentage of all residents

Expert opinions have also been combined with mathematical techniques for aggregating selected indicators. Haki et al. (2004) develop a neighbourhood vulnerability index to earthquake risk, based on the relative importance of indicators derived through pairwise

comparisons from expert opinion. The resulting social vulnerability index is calculated as the weighted sum of indicators and subjected to further spatial analyses in a GIS. Other methods reported in the literature have enabled the end user to actively select appropriate vulnerability indicators. Barroca et al. (2006) for instance, centralise urban, sub-catchment or river basin scale vulnerability indicators within an online tool, to support the various needs of different decision makers. In a similar approach, Alexander et al. (2013) present a GIS-based method whereby emergency professionals can essentially construct their own vulnerability indices and weight indicators according to relative importance in decision making, thus integrating subjectivity within the construction process.

The work of Brooks et al. (2005) provides a useful example of both etic and informed-etic approaches to vulnerability assessment. This particular study examines generic (rather than context-specific) vulnerability indicators and their predictive capabilities against recorded mortalities from climatological hazards (employed as a proxy for risk). Each indicator is averaged over a decadal period to produce data series data, then correlated with the data series for mortality (risk). In the first approach, a composite, equal-weighted index is derived from averaging indicator scores (i.e. etic approach). The resulting ranks of each country are then juxtaposed with those derived from expert-informed indices. In this second method, focus groups and Delphi surveys with academic experts are employed to elicit the relative importance of each indicator; each set of rankings is then used to generate an individual composite index (i.e. multiple indices are produced from this method). Whilst the former method is regarded as an invaluable technique to identify hotspots of vulnerability for targeting further research or adaption strategies, the authors equally emphasise the value of the second method for examining the structural factors of vulnerability.

Etic-orientated research is not only manifest in indicator-based studies. Quantitative studies derived from large scale surveys also mirror etic ideologies. Thrush et al. (2005b) demonstrate a disparity between scientific formulations of flood risk and residents' perceptions of risk; indeed 41% of residential properties declared by the EA as at 'flood risk', were not aware of this risk in 2005 (Fielding and Fielding, 2008). Secondary data analysis revealed that social class, flood experience and length of residency are the best predictors of flood risk awareness, alongside a number of other variables such as property type and tenure (Thrush et al., 2005b). In addition, adjacent research in the UK has revealed patterns of environmental injustice, demonstrating that those of a lower social class are more likely to be exposed to fluvial and

tidal flooding (Fielding and Burningham, 2005). When it comes to questionnaire analysis, the etic-emic distinction is somewhat blurred and subject to debate. On one hand, it might be argued that surveys can elicit "insider" perspectives, whilst enabling large sample sizes and statistical analysis; i.e. an etic-method is used to elicit an emic perspective (Fielding and Fielding, 2008). On the other, this quantitative treatment is not addressing the underlying processes informing the view recorded in the questionnaire, or the experience of the studied phenomenon. This thesis is orientated from the latter standpoint and it is generally regarded that questionnaire-elicited data constitutes an informed-etic approach.

Ultimately, the index/indicator and quantitative methodologies described in this section reflect etic-orientated constructions of vulnerability. Regardless of whether 'expert' subjectivities have been included (i.e. informed-etic), the procedure maintains a measured distance between the researcher and those affected by vulnerability. Through this transition from etic to informed-etic approaches, it can be observed how the relational nature of the term *vulnerability* in terms of research subjects (i.e. who is vulnerable), becomes more blurred.

Strengths and limitations

There are a number of strengths to this type of research. Firstly, the application of indicators and indices has supported comparative studies at global (UNDP, 2004; Peduzzi et al., 2009), national (Cutter et al., 2003; Adger et al., 2004) and local scales (Granger et al., 1999; Dwyer et al., 2004). In this context, indicators have become crucial tools for revealing the broader spatio-temporal patterns of vulnerability, helping to steer decision making and target "hot spot" locations for priority. Furthermore, the role that this body of research has played in facilitating the integration of social sciences in decision making cannot be overlooked. This has been further supported by technological advancements with Geographic Information Systems (GIS), enabling mapping of vulnerability alongside environmental and hazard conditions to provide holistic pictures of risk (e.g. Cutter et al., 2003).

It is also important to acknowledge the limitations of this approach. A recurring criticism is that selection of indicators is often data-driven, especially in cases of global or inter-country comparisons were there is less consistency in the availability of data. Absent or poorly-recorded data between various census records, invariably means indicators need to be adjusted or removed altogether in order to create a transferable method. Moreover, the *context* and *hazard-specific* nature of indicators is not always addressed (Steinführer et al.,

2009). There is also a concern that the preoccupation with mapping may constrain what is represented as vulnerability (LWEC, 2010). Related to this, is the fact that indices are typically used to locate priority areas for mitigation, but do not identify potentially underlying processes driving vulnerability (King and McGregor, 2000; Smit and Wandel, 2006). However, Brooks et al. (2005) defends this and argues that identifying vulnerability via indices can provide an entry point to research, one that allows improved understanding of the processes driving or exacerbating vulnerability.

Objectivity and measured 'distance' is one of the main identifying features of these etic-orientated approaches to vulnerability research, yet equal-weighted models are imposing an assumption of vulnerability and potentially obscuring the influence of certain variables over others. By combining and averaging indicators or several indices, the resulting score for vulnerability may be downgraded where it might otherwise have ranked higher on a single factor (Rygel et al., 2006). Moreover, composite indices may mask the 'make-up' and structure of vulnerability. Translating vulnerability into a 'product' (a metric score) ultimately sacrifices the complexity and dynamic characteristics of the vulnerability concept (Birkmann and Wisner, 2006). Furthermore, homogenising an area into a singular, aggregated score for vulnerability gives the impression of homogeneity and sacrifices existing local variability, crucial for targeted mitigation strategies (Wilson, 2008). Adger et al. (2005) stress the importance of remaining mindful that risk and vulnerability are experienced across different spatial, temporal and societal scales, and interact between and within these levels. This argument may be neglected in the cross-sectional research design, providing a 'snap-shot' of conditions at a specific point in time. However, efforts have been made to employ indices to "track" spatio-temporal patterns of vulnerability (Cutter and Finch, 2007).

Another tension briefly discussed by Birkmann and Wisner (2006), relates to the ethical issues involved as the authors discuss whether research participants (i.e. the population at-risk) are viewed as research objects or research subjects. This is a valid criticism and it is rare to see authors engage with the ethical implications of labelling one community as vulnerable over another. Also of concern, is the risk of stereotyping certain socio-demographic groups through the taxonomic nature of indices, which offer a 'check list' of vulnerability characteristics (Brown and Dammery, 2002; Wilson, 2008). Fordham and Kettridge (1998) also reflect on his on their article "*Men must work and women must weep*". Additionally, De Marchi and Scolobig (2012) argue that there is a risk of creating 'false positives'; for instance, a high concentration

of lone pensioners would score highly on such scales, yet if there is a strong social cohesion amongst this group (not registered in census data) this may reduce vulnerability (Thrush et al., 2005). Increasingly, it seems that authors are acknowledging that the "*people held as vulnerable might perceive or experience their own vulnerability differently than external observers*" (Kuhlicke and Steinführer, 2010: 13). This disparity is the sort of detailed insight that is emergent from emic-orientated research.

2.6 EMIC & INFORMED-EMIC CONSTRUCTIONS OF VULNERABILITY

Contrasting with the etic perspective, is emic-orientated research seeking proximity to those affected by vulnerability (i.e. "insiders"). Correspondingly, much of this research involves "bottom up" approaches through interaction with individuals, households and communities concerned. Conditions and factors shaping vulnerability are emergent from such empirical research via interaction with people, rather than predefined and imposed from an etic perspective (Smit and Wandel, 2006). Across this part of the spectrum, studies may employ informed-emic approaches, such as semi-structured or in-depth interview; or draw from strategies more firmly established in emic principles, such as participatory methods for interaction and ethnographic practices (Heijmans, 2001; Heijmans and Victoria, 2001; Cannon et al., 2003; Delica-Willison and Willison, 2004; Hillhorst and Bankoff, 2004; Eriksen et al., 2005).

Methods for facilitating participatory community engagement are being increasingly encouraged in policy. The Hyogo Framework for Action (HFA) emphasises the need for vulnerability mitigation in the pursuit of resilient societies and highlights the importance of meaningful indicators and indices (i.e. etic-orientated perspectives); as well as the need for participation to facilitate knowledge exchange, partnership-working and empowerment (UN/ISDR, 2005). The importance of local capacity and local knowledge is also being recognised in current shifts in risk governance in FRM (Chapter 1: Kuhlicke and Steinführer, 2010).

Techniques such as *Capacities and Vulnerability Analysis* (CVA) provide a holistic framework for considering the physical, social, organisational, motivational and attitudinal factors shaping people's *vulnerabilities and capacities* (Anderson and Woodrow, 1998). The need to consider local capacities for coping and adaption has been emphasised by several authors to enhance

the representation of people as *active agents* rather than *passive victims* (Heijmans, 2001; Fordham, 2004; Eriksen et al., 2005). Indeed, Anderson and Woodrow assert that participation is essential and a "*powerful way to help them increase their understanding of their own situation, and therefore, their capacities to effect desired change*" (p21). In a similar ilk, Participatory Rural Appraisal (PRA) is based on a series of participant-led activities originally designed to examine rural life and empower those under study (Chambers, 2001; 2002; Mayoux and Chambers, 2005); though this has more recently filtered into disaster research in order to further local understanding and empower at-risk communities (e.g. Donovan 2010).

With regards to vulnerability specifically, research by Heijmans (2001) and Heijmans and Victoria (2001) has demonstrated the multiple ways in which the concept of vulnerability is applied by disaster management agencies and often imposed upon communities. The subjective construction of vulnerability is keenly stressed by these authors, who argued that "*vulnerability is a matter of perception*". Moreover, the perception of disaster agencies may be at odds with that belonging to the community itself. In support, Furedi (2007) discusses how vulnerability is a concept emergent from professional discourses used to diagnose or describe communities; "*Even advocates concede that it is a term that outsiders use to label others*" (p48). In this paper, Furedi cautions against the increasing reference to "vulnerable groups" and how this identity is almost automatically attached to children, women, the poor and disabled, and used as "*a key marker and defining feature of a wide variety of group identities*" (p488). Fordham (2004) also observes how "the vulnerable" may be represented in undifferentiated terms in a way that can be disempowering.

In the context of vulnerability to flooding, Thrush et al. (2005) employ focus groups with these so-called vulnerable groups. This research reveals how vulnerability is appraised in relative terms; namely in the context of everyday pressures (e.g. finances), future security, and current perceived threat. Although risk awareness was found to vary systematically between vulnerable groups, it appeared to be shaped by awareness of flood history rather than group membership. Interestingly when asked the open, abstract question about their level of vulnerability, individuals 'perceived' it as a condition affecting others with limited resources (Thrush et al., 2005). On the basis of this research, a number of practical recommendations were made for improving the flood warning service and access to information in the UK, such as the need for more targeted campaigns and involvement of local charities and organisations, with local and specialist knowledge of vulnerable groups. Furthermore, local flood action

groups were cited as a potential strategy for preserving local flood knowledge, maintaining a 'vulnerable persons' database, as well as a source of advice and information. These insights are invaluable for this thesis, which similarly seeks to build upon these emic contributions.

Fundamentally, *vulnerability* is a *relational* term (Green and McFadden, 2007). The previous section observed how the boundaries of vulnerability between subjects becomes increasing blurred between etic to informed-etic constructions, and this trend continues across the informed-emic and emic constructions of vulnerability. Rather than conceiving vulnerability as a condition of pre-defined social groups, emic-orientated constructions emphasise the blurred and fuzzy nature of vulnerability, and socially constructed nature of its boundaries.

2.7 ALIGNING ACADEMIC CONSTRUCTIONS OF VULNERABILITY TO THE ETIC-EMIC SPECTRUM

Across the etic-emic spectrum there are apparent differences in the manner in which vulnerability is approached and ultimately constructed in academia. Essentially, distinctions can be made between research seeking *measured detachment*, or *subjective attachment* to the accounts and experiences of research participants. However, also observed within this gradient, is a body of research that somewhat blurs this distinction by mixing methods and illustrates the mutually-informative nature of etic-emic perspectives. These observations from the literature are aligned and 'mapped' across this gradient in Figure 2.5.

Resulting constructions of vulnerability reflect different epistemological and methodological decisions, and related research questions, scales of analysis and overall purpose of the research (Figure 2.3). It is argued here, that etic and emic orientated research should be regarded as equally valuable in the contribution to vulnerability knowledge. These perspectives are not competitive, but rather complementary in nature.

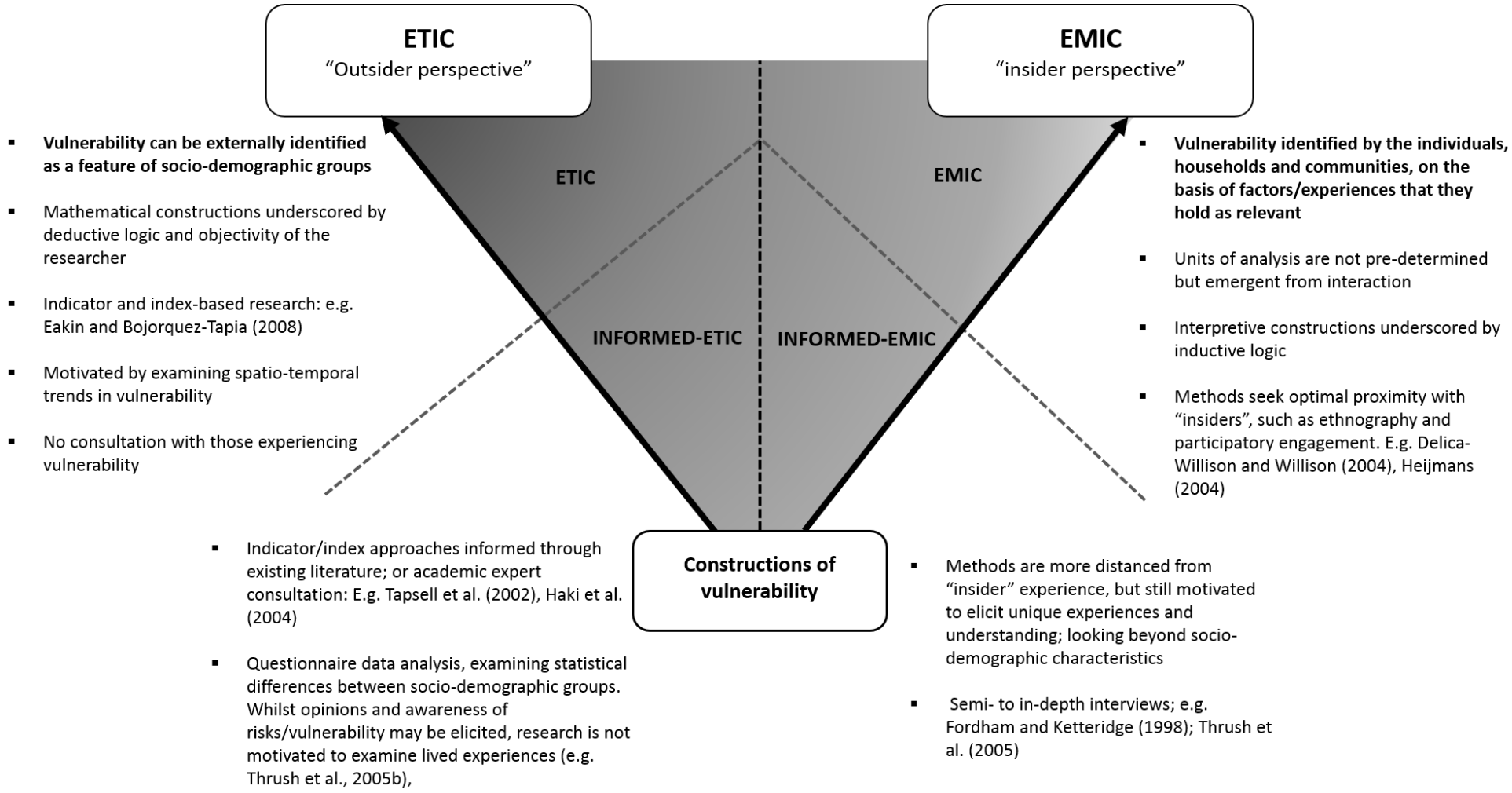


Figure 2.5: Distinguishing features of academic vulnerability research across the etic-emic spectrum

2.8 THESIS AIMS AND RESEARCH QUESTIONS

Vulnerability research currently occupies a diverse and contested intellectual space that could arguably benefit from a fresh perspective to the etic-emic debate established in other disciplines. This chapter has developed a framework for facilitating this debate and considered the unique contributions to knowledge emergent through etic and emic-orientated studies. However, not fully explored in the etic-emic literature is the assumption of "insiders", the potential heterogeneity within this group and how this might influence resulting constructions of knowledge in research. Indeed, just as the researcher adopts a position that is etically or emically orientated, it stands to reason that research participants will also maintain different degrees of conceptual distance or proximity to the topic under investigation; where "insiders" are defined as those able to draw from personal experiences of flooding and vulnerability (Section 2.4.2).This research develops the notion of "*insiderness*" and examines the extent to which this influences constructions of flood vulnerability. To date, there has been limited qualitative study into social constructions of vulnerability (e.g. Thrush et al., 2005); yet this insight could reveal opportunities and barriers to enhancing self-reliance and resilience amongst households at-risk of flooding (Chapter 1).

The overall aim of this thesis therefore is to examine how constructions of vulnerability vary across etic-emic gradients. To address this, vulnerability is investigated from the perspective of;

- **Research communities** approaching vulnerability through varied disciplinary backgrounds and epistemologies (this chapter)

- **Professionals** concerned with Flood Incident Management (FIM), who must identify and act upon vulnerability in an emergency situation (Chapter 8)

- **Residents**, including those within and outside objective definitions of risk and vulnerability (Chapter 5 & 6)

This chapter represents the first stage of this analysis and highlights how multiple constructions of vulnerability are shaped through the research process. Subsequent analysis will examine how vulnerability is constructed from the perspective of residents and emergency

professionals, and consider the extent to which these perspectives can be aligned to the etic-emic spectrum. This will be examined through the notion of "***insiderness***". To date, research has largely focused on contrasting socio-demographic groups or those with or without previous flood experience, and has not considered the influence of *insiderness* (and potentially multiple variables shaping this), upon constructions of vulnerability. The possibility and appropriateness of defining insider-outsider boundaries is evaluated in the context of whether such distinctions can inform more meaningful assessments of vulnerability at the local scale.

This thesis is centred on *vulnerability*, which has been somewhat dominated to-date by the extensive body of research into perceptions of *risk*. Therefore, this study will extend knowledge into residents' constructions of vulnerability and facilitate insights into the variables informing self-declared vulnerabilities. This is further developed in the under-researched context of urban flooding (pluvial and surface water). To this end, this thesis provides insight into the barriers and opportunities for enhancing household resilience to flooding, and is guided by the following questions:

> **RQ1**: How is vulnerability constructed and experienced by residents in locations at risk of flooding? What are the variables influencing self-declared vulnerabilities? What are the implications of self-declared vulnerabilities?
>
> **RQ2**: How is vulnerability constructed by emergency professionals? How do these constructions shape identities of vulnerability and professionals' expectations of people's ability to respond and recover from flooding?
>
> **RQ3**: Is it possible to infer degrees of "insiderness" and define insider-outsider boundaries amongst research participants? To what degree does *insiderness* influence constructions and declarations of vulnerability? Can these constructions be aligned to the etic-emic spectrum?

This research is conducted in two socially-contrasting locations exposed to multiple flood drivers; a Bradford town in West Yorkshire (fluvial and pluvial flooding) and a town on the Isle of Wight (tidal and pluvial flooding). The thesis now turns its attention to these case studies and outlines the relevant contextual information for this research.

Contextual background & case studies

Chapter 3

CONTENTS

3.1 INTRODUCTION

This Chapter develops the contextual setting for the research. Firstly described is the context of emergency management and Flood Incident Management (FIM) in the UK, which underscores the roles of emergency professionals interviewed as part of this study. Secondly the geographical setting is developed. The purpose of this geographical description is to establish these field locations as appropriate contexts within which to address the research questions outlined in Section 2.8. Emphasis is given to the geographical, social and flood contexts of two selected urban catchments in the UK; a Bradford town in West Yorkshire, northern England, and a town on the Isle of Wight, located off the Hampshire coastline in southern England[7].

Previous research conducted in these study areas is also briefly reviewed; this includes the results of numerical flood modelling conducted as part of the EPSRC-funded Flood Risk Management Research Consortium (FRMRC, *www.floodrisk.org.uk/*) (Allitt et al., 2009; Chen et al., 2010). These results were made available to this research under the auspices of FRMRC and informed some methodological decisions outlined in Chapter 4.

3.2 EMERGENCY MANAGEMENT IN THE UK

Emergency management in the UK is organised through the statutory framework of the Civil Contingencies Act[8] ("the Act"; HM Government, 2004). The Act outlines the civil protection duties and emergency powers of Category One and Two Responders (as outlined in Table 3.1), and is supported by the Contingency Planning Regulations[9] (HM Government, 2005) and a number of non-statutory guidance documents supporting emergency preparation and planning, response and recovery (e.g. HM Government, 2012). The Act is viewed within a wider context for Integrated Emergency Management (IEM), to facilitate joined-up, multi-agency response in the prevention and management of emergencies through the stages of anticipation, assessment, prevention, preparation, response and recovery (HM Government, 2011).

[7] The selection of these study sites is further justified in Chapter 4.
[8] *Emergency* is defined as an event or situation which threatens serious damage to human welfare in a place in the UK; an event or situation which threatens serious damage to the environment of a place in the UK, or; war or terrorism, which threatens serious damage to the security of the UK (HM Government, 2004)
[9] Also referred to as the Civil Contingencies Act Regulations (2005)

Table 3.1: Category One and Category Two Responders

CATEGORY ONE RESPONDERS		CATEGORY TWO RESPONDERS	
Local Authority	A county council, district council; including emergency management	**Utilities**	Electricity; Gas; Water and sewerage; Public communication providers
Emergency Services	A chief officer of Police; A chief constable of British Transport Police force; A Fire and Rescue authority; Maritime and Coastguard agency; Ambulance service	**Transport Operators**	Network Rail; Train operating companies; London underground and Transport for London; Airport operators; Harbour authorities; Highways Agency
Health authority	National Health Service Commissioning Board (NHSCB); Public Health England (PHE); Foundation trusts; Acute trusts	**Health and Safety Executive**	
		NHS Clinical Commissioning Groups (CCGs)	
Environment Agency			

Category One responders are central to emergency response and are subject to the full set of civil protection duties. This includes developing and implementing a number of plans (contingency, emergency, business continuity); establishing arrangements for sharing information (with other responders and the public); meeting the responsibilities within the existing remits of the individual agency or organisation; and ensuring the 'joined-up' working across agencies (see Figure 3.1). Category Two responders function as 'cooperating bodies' to the Category One response and are principally tasked with sharing information and advice with all necessary responders involved (HM Government, 2004). The statutory responsibility for multi-agency cooperation is supported through Local Resilience Forums[10] (LRF), which brings Category One and Two Responders for multi-agency discussion, planning and exercising for the array of threats posed to civil protection in the UK (as outlined in the Contingency Planning Regulations, 2005). In addition, Community Risk Registers[11] (CRR) are also developed and maintained for each LRF area, to ensure that responders have a shared understanding of risks[12] and can (proportionately) plan, prioritise and allocate resources to manage these (HM Government,2005).

[10] The LRF is a non-legal entity, but satisfies the statutory duties outlined in the Civil Contingencies Act (2004) and the Contingency Planning Regulations 2005 (see HM Government, 2011). A total of 42 LRFs exist in the UK and defined by the boundaries of Police Areas. Note that the Isle of Wight (selected for study), has a separate Island Resilience Forum (IRF) and is part of Hampshire & Isle of Wight LRF.

[11] Under the Contingencies Planning Regulations (2005) responders have a legal responsibility to maintain a Community Risk Register (para. 15, part 3 in HM Government, 2005)

[12] Where *risk* is assessed in terms of likelihood and impact; thus embracing both the physical and social vulnerability of receptors exposed to flooding.

- Establish emergency plans (including recovery)
- Establish arrangements for business continuity management
- Establish arrangements to warn, inform and advise the public
- Provide advise and assistance to business and voluntary organisations about business continuity management (LA only)
- Professional training and exercising

- Assess risk of occurring emergencies to inform contingency plans
- Enact emergency plans
- Warn, inform and advise the public (and media)

Crisis management to prevent or avert immediate risk.

Consequence management to minimise impact

- Number 1 priority to protect human life
- Operational response to 999 calls
- Evacuation
- Establish rest-centres

- Enact recovery plans - Where resources allow, it is advocated that recovery is initiated from the start of an emergency (HM Government, 2011)
- Impact assessment
- Restoration of utilities and transport networks
- Monitor and protect public health
- Environmental protection
- Information and media management

Civil protection duties of Category 1 and 2 responders, at *all* stages of emergency management to;

- Share and coordinate information with other responders
- Cooperate with other responders to enhance coordination and efficiency

Figure 3.1: Key duties of Category One Responders outlined through the emergency management cycle (informed by HM Government, 2004; 2005)

Integrated emergency response is coordinated through a tiered command structure, convened at operational, tactical and strategic levels[13]. The *operational* level describes the 'hands on' work undertaken at the site of the emergency or incident, and may be coordinated through *tactical* level decision making. If an event escalates in severity or geographical spread, then a Strategic Coordinating Group (SCG; or Gold Command) may be established to coordinate activities and objectives from a high level perspective[14] (HM Government, 2012). In times of regional or national emergencies, the SCG will coordinate with other forums or high-level tiers of coordination (such as the National Security Council[15]). This is outlined in Figure 3.2. Overall, UK emergency management is driven by the principle of *subsidiarity*, which advocates the devolution of decision making to the lowest appropriate scale, with collaboration and coordination at the highest level necessary (HM Government, 2011). The *precautionary* principle is also adopted in decisions about whether to activate coordinating groups (HM Government, 2012).

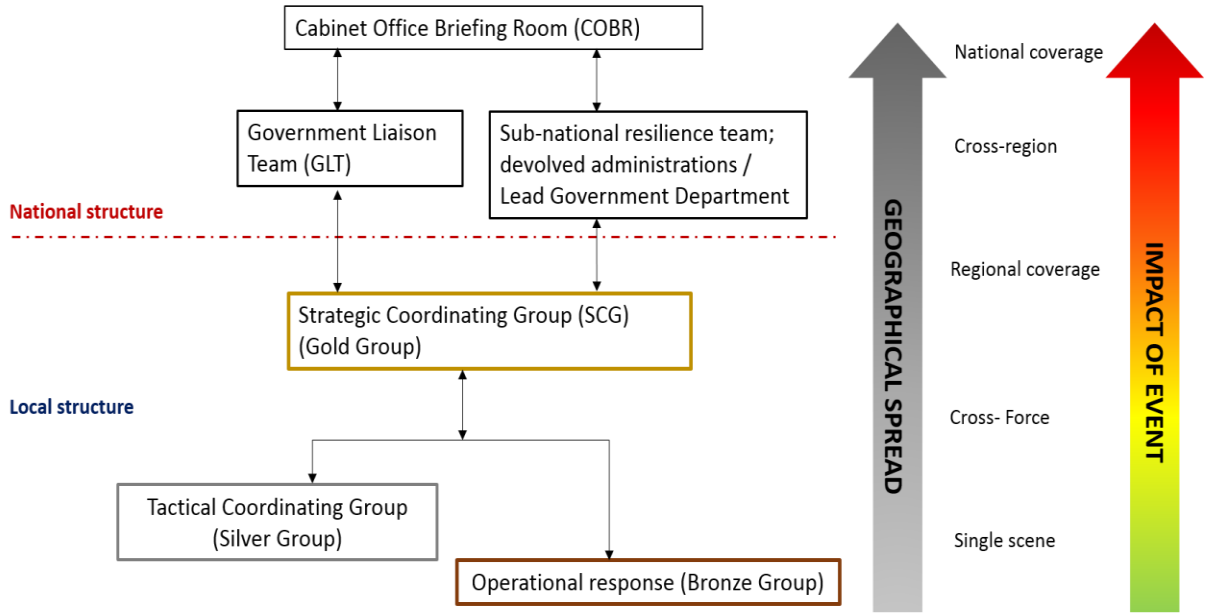


Figure 3.2: Command and control structure for emergency management in the UK (informed by HM Government; 2011, 2012). As the "impact of event" increases (i.e. escalates in severity or geographical spread[16]), higher tiers for command and control will be consulted.

[13] Within single agencies these tiers of command and control are also referred to as bronze, silver and gold, respectively.

[14] In multi-agency tactical or strategic coordinating groups, no single responding agency has *command* control (HM Government, 2012).

[15] The National Security Council is a forum for governmental discussion on matters of national security and includes three ministerial sub-committees, including a committee on threats, hazards, resilience and contingencies; see http://old.cabinetoffice.gov.uk/content/national-security-council

[16] *Impact* defined as "*the scale of the consequences of a hazard, threat or emergency expressed in terms of a reduction in human welfare, damage to the environment and loss of security"* (HM Government, 2012: p178)

To this point, the discussion has focused on the statutory responsibilities of emergency responders. A final point to note, is that in the UK there is a national agenda for *Community Resilience*, which is led by the Civil Contingencies Secretariat (CCS) and enacted at local scales. The main objective of this programme is to increase the resilience of individuals, households and communities against possible threats, by increasing risk-awareness and encouraging active participation in emergency preparedness (e.g. developing community emergency plans). Although the public are not statutorily obligated to participate, this agenda is in synergy with policy shifts in FRM discussed in Chapter 1 and highlights an increasing expectation on the public to actively participate and adopt some responsibility in risk management.

The role of 'vulnerability' in emergency management

The identification of 'vulnerable people' is a key aspect of emergency management. Official guidance accompanying the Civil Contingencies Act defines vulnerable people as *those that are less able to help themselves in the circumstances of an emergency* (HM Government, 2008). Category One Responders have a responsibility to plan and meet the needs of so-called vulnerable people. In the non-statutory guidance documents available to these professionals, a host of defining characteristics are listed to support identification of 'vulnerable people' (Table 3.2; HM Government, 2008). To facilitate this process, mechanisms for networking and information sharing are established to help access these social groups pre-defined as vulnerable (HM Government, 2008). The impracticalities of creating inclusive databases of household-scale vulnerabilities (i.e. keeping it up to date and issues surrounding data protection), means that emergency planners are required to build inclusive lists, not of 'vulnerable groups' *per se*, but detailing the appropriate agencies (and databases) responsible for these groups and pathways for accessing these lists when required. This is coordinated through the Local Authority (LA) and constituent departments of Adult and Social Care. From these networks, emergency planners and responders are able to gauge the nature and scale of the response required. Moreover, networks can be employed as a means of 'pushing' warning messages and 'pulling' potentially vulnerable individuals towards the authorities in advance of an emergency or major incident (HM Government, 2008). The influence of this approach and formalised definition of vulnerability upon professionals' constructions, is examined in depth in Chapter 8.

Table 3.2: Identifying vulnerable people through organisations (from HM Government, 2008: p14)

Potentially vulnerable individual / group	Examples and Notes	Target through the following organisations/agencies
Children	Where children are concerned, whilst at school the school authorities have duty of care responsibilities. Certain schools may require more attention than others.	LEA schools through Local Authorities, and non-LEA schools through their governing body or proprietor. Crèches / playgroups / nurseries.
Older people	Certain sections of the elderly community including those of ill health requiring regular medication and/or medical support equipment. The "oldest-old" (aged 80 or over) are more likely to be widowed women, which may impact upon your planning.	Residential Care homes Help the Aged Adult Social Care Nursing homes
Mobility impaired	For example; wheel chair users; leg injuries (e.g. on crutches); bedridden / non-movers; slow movers	Residential Care homes Charities
Mental / cognitive function impaired	For example; developmental disabilities; clinical psychiatric needs; learning disabilities	Health service providers Local Health Authorities
Sensory impaired	For example; blind or reduced sight; deaf; speech and other communication impaired.	Charities e.g. the Deaf Council Local groups
Individuals supported by health or local authorities		Social services GP surgeries
Temporarily or permanently ill	Potentially a large group encompassing not only those that need regular medical attention (e.g. dialysis, oxygen or a continuous supply of drugs), but those with chronic illnesses that may be exacerbated or destabilised either as a result of the evacuation or because prescription drugs were left behind.	GP surgeries Other health providers (public, private or charitable hospitals etc.) Community nurses
Individuals cared for by relatives		GP surgeries Carers groups
Homeless		Shelters, soup kitchens
Pregnant women		GP surgeries
Minority language speakers		Community groups Job centre plus
Tourists		Transport and travel companies Hoteliers
Travelling community		LA traveller services Police liaison officer

3.3 FLOOD INCIDENT MANAGEMENT (FIM) IN THE UK

Flood Incident Management (FIM) is linked to a national strategy for Flood and Coastal Erosion Risk Management (FCERM) in the UK, for which the Environment Agency (EA) is responsible (EA, 2011; HM Government, 2010). The overall aim of FIM is to reduce the consequences of flooding. This is steered by two key objectives, to firstly, improve forecasting, warning and rapid response to flood incidents; and secondly, to increase public awareness and engagement with Flood Risk Management (FRM) (EA, 2011). The National Flood Emergency Framework outlines a strategic policy framework for emergency planning and response (Defra, 2011). The roles of Category 1 responders in this context, are summarised in Figure 3.3.

Information on flood probability is provided through the Flood Forecasting Centre (FFC) in the form of daily flood guidance statements. These are issued to Category 1 and 2 Responders, providing 3-day and 5-day forecasts for county and regional levels of risk, respectively. In addition to guidance for river and coastal flooding, Extreme Rainfall Alerts (ERA) are also issued through the FFC. Other weather-related information is available through the Met Office, and river and sea-level information available from the EA. When a medium or high risk is presented, the Flood Advisory Service provides a joint teleconference facility to discuss and coordinate incoming information.

Pre-planning is a central requirement in delivering efficient and effective emergency response to flooding. Responders are required to work together through the LRF to complete Multi-Agency Flood Plans (MAFP), as part of their statutory responsibilities (HM Government, 2004). This includes all aspects of response and recovery specifically related to flooding[17]; guidance for these plans is presented in Part 12 of the National Flood Emergency Framework (Defra, 2011). Essentially, these plans must provide flood risk summaries for each community and specific triggers and thresholds for activating flood emergency arrangements (e.g. tactical and strategic commands). Arrangements are also made for evacuating and sheltering displaced people. In addition to displaced persons, specific attention is given to the needs and requirements of those designated as 'vulnerable', under the criteria selected and itemised in Table 3.2. Guidelines suggest that such 'vulnerable groups' are to be identified through the mapping of key facilities, such as schools and elderly care homes. Whilst it is suggested that buildings can be categorised according to the vulnerability of the population within, equally critical is the identification of vulnerable buildings according to their need to remain operational (e.g. emergency response centres, electricity and gas stations). On one hand, this can be

[17] Specific plans accompany existing generic plans for emergency response to provide more detail for specific emergencies or types of incidents identified from the Community Risk Register.

seen as making a distinction between the physical vulnerability of infrastructure; on another, it indicates that social vulnerability is recognised beyond the physical, spatial boundaries of flooding. These observations are unpicked further in Chapter 8.

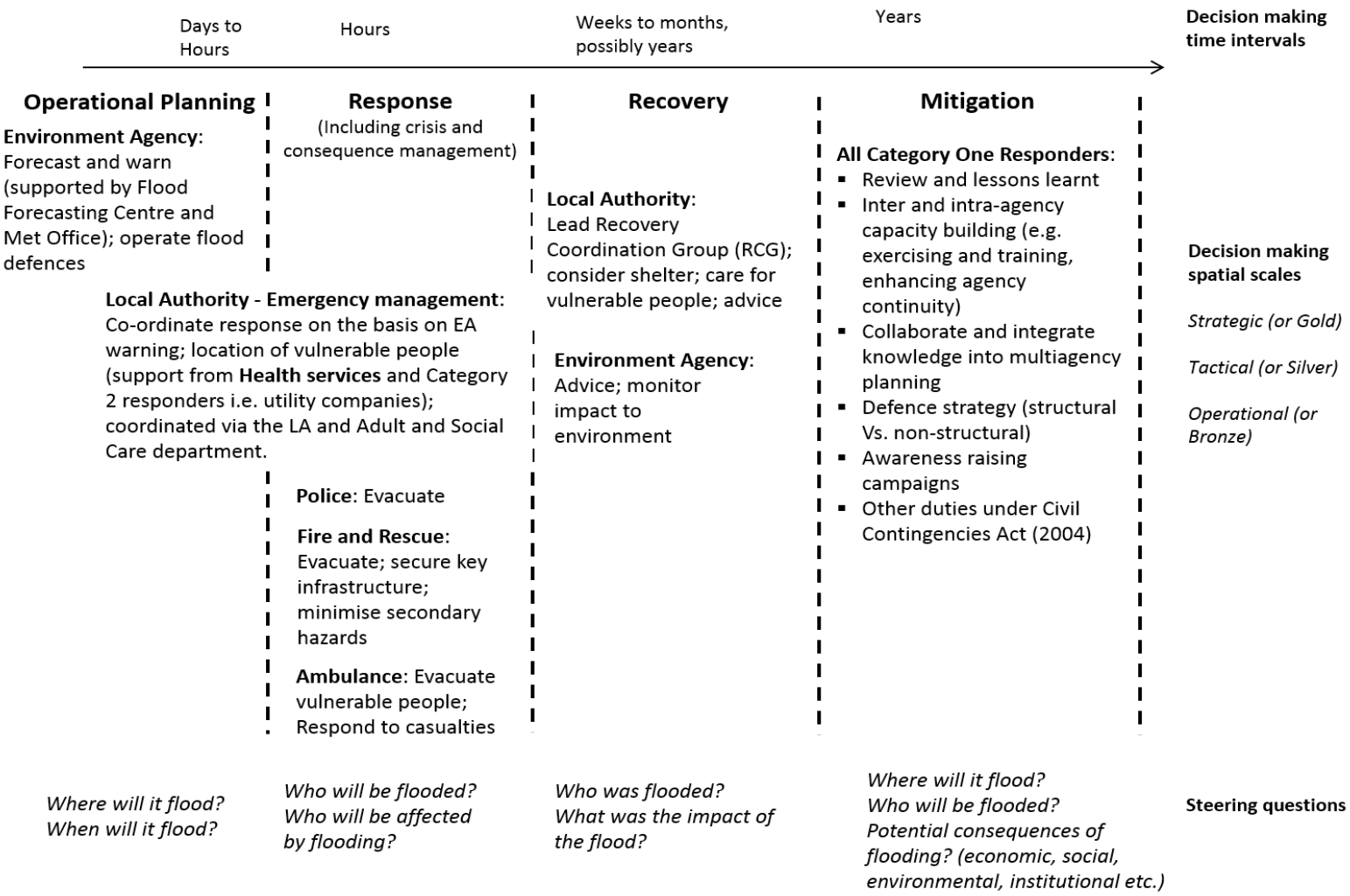


Figure 3.3: Roles of Category One Responders within Flood Incident Management (FIM) (from Alexander et al., 2013)

3.4 GEOGRAPHICAL CONTEXT FOR RESEARCH

This section presents the geographical, social and flood contexts of the selected case studies for this research. Two urban catchments were selected in Bradford, West Yorkshire and the Isle of Wight (IOW), though for ethical reasons, exact locations are disguised in this discussion. This approach is discussed further in Chapter 4, along with the sampling strategy for selecting these case studies and participants within these locations.

3.4.1 BRADFORD CASE STUDY

Geographical setting

An urban town was selected in Bradford, West Yorkshire in Northern England (Figure 3.4). Bradford district covers an area of approximately 140 square miles and is topographically diverse; ranging from approximately 43m in the narrow valley bottoms to 500m in the Southern Pennines. The district includes a number of sites of scientific, environmental and historical interest (see EA, 2010b). The area selected for this research is located in the north west of the county within the catchment of two rivers; the River Aire and the Worth.

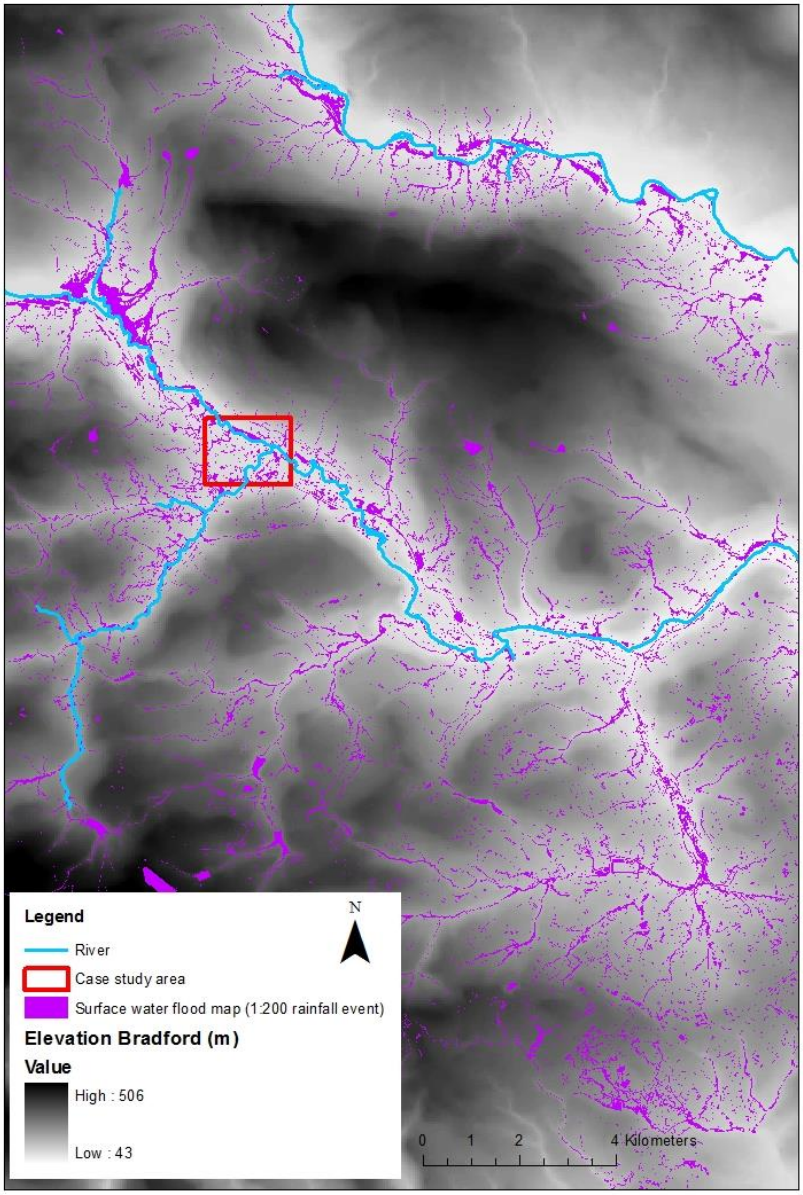


Figure 3.4: Elevation of Bradford district overlaid with Flood Map for Surface water flooding (Copyright © and Database rights Environment Agency 2013). Elevation within selected study site ranges from 83m (near river in the east) to 94m in the west. Digital terrain model based on Panorama DTM, Scale 1:50,000, June 2006 and downloaded in Sept 2012 from OS MasterMap® (© Crown Copyright Ordnance Survey. An Ordnance Survey/EDINA supplied service).

Social setting

Bradford district has a total population of 522,452 people and is a known area of cultural and ethnic diversity. Recent census data for 2011 shows that overall, 63.9% of the population are White British, with the majority of other ethnic groups from Asian backgrounds; including 24.4% Pakinistani and 2.6% Indian. The unemployment rate in the district is 11.1% and higher

than the regional[18] (9%) and national (7.9%) average[19]. Likewise, the percentage of the working age population claiming a key benefit is also higher than national and regional averages, at 19%.

The census ward to which this selected case study is located, has a predominantly White population (80.3%) and Asian community, with 11.2% Pakistani and 2.1% Bangladeshi (Bradford Observatory, 2011). Unemployment is slightly lower than the district and regional average, with 4.7% of the economically active population listed as unemployed. Moreover, home ownership is higher than district and regional averages, at 74.8%. The case study area itself is characterised by predominantly terraced housing, with a small concentration of social housing located adjacent to the river. Social deprivation in the study area is relatively high according to the national ranking system applied through the Index of Multiple Deprivation (IMD: DCLG, 2008); ranging from a rank of 2059 to 16,101 (where 1 is high deprivation, out of a possible 32,482). This national method is based on the aggregation of seven domain indices, including income, employment, health and disability, education skills and training, barriers to housing and services, living environment and crime. Each domain is weighted within the final score for deprivation (see DCLG, 2008). The IMD is currently used within Catchment Flood Management Plans (CFMP) for England and Wales. The predecessor to this, was the Social Flood Vulnerability Index by Tapsell et al. (2002), which identifies areas for nationally low and average vulnerability within the selected study site (see Section 6.5).

Flood history and previous flood research

The location of this research is included within the Catchment Flood Management Plan (CFMP) for the River Aire, which is exposed to fluvial and pluvial flooding (Figure 3.5). The River Aire flows 148km from its source in the Yorkshire Dales, near Malham, and includes 125km of raised defences. Without defences taken into account, currently 13,400 properties are located within the 100 year floodplain, though this may increase to 14,034 properties under future scenarios for climate change (EA, 2010b). Both fluvial and pluvial flooding is likely to increase in terms of frequency and severity, and within the selected case study, the number of properties at risk of flooding are predicted to double under the future scenarios modelled (EA, 2010b).

[18] Bradford district is defined within the Yorkshire and The Humber region of England

[19] Figures for Unemployment rates identified from available for 2011 census data for Bradford local authority; http://www.neighbourhood.statistics.gov.uk/dissemination/

The study site is situated in a sub-catchment of two rivers, prone to rapid onset flooding. Overall, 3,630 properties at risk from fluvial and pluvial flooding within this sub-catchment (not accounting for flood defences). Within the CFMP, there is a recognised need to take further action to reduce flood risk (according to a Policy 5 vision; see EA, ibid); this includes the need to maintain and possibly extend the current flood defence system.

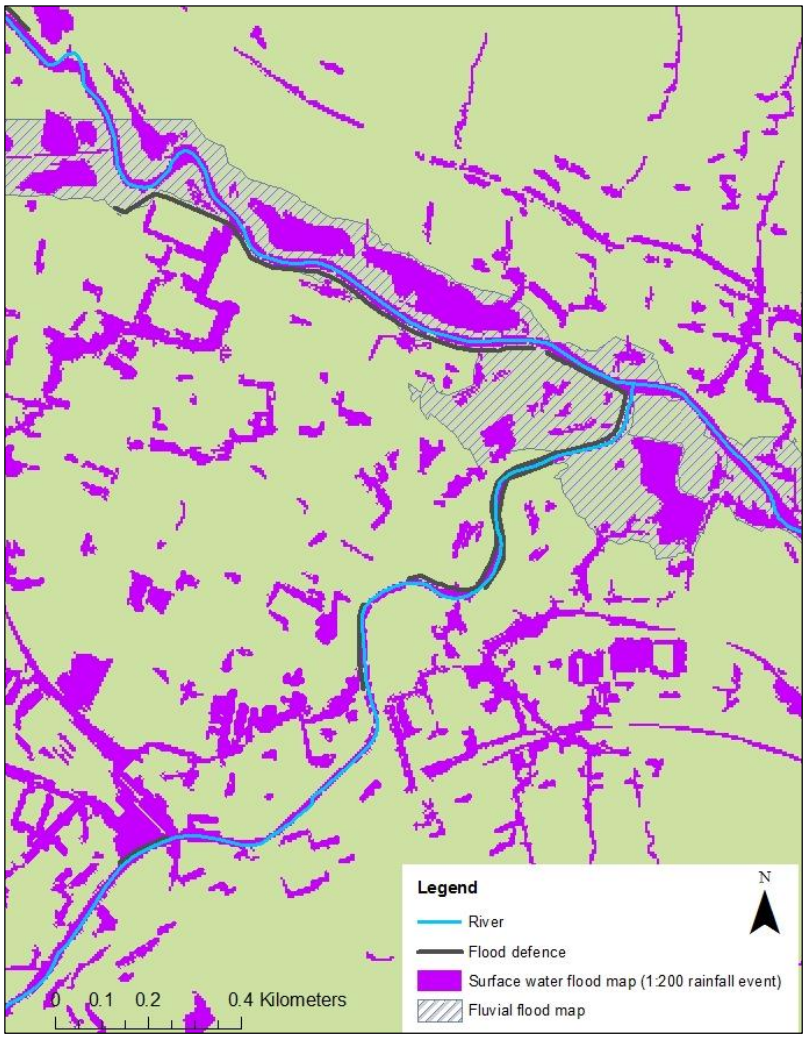


Figure 3.5: Fluvial and pluvial flood boundaries for selected case study; based on Flood Map for Surface Water (200 year event) and Fluvial Flood Map (Copyright © and Database rights Environment Agency 2013; © Ordnance Survey Crown copyright; some information within the Flood Map is based on digital spatial data licensed from the Centre of Ecology and Hydrology © NERC).

The study area has experienced significant fluvial flooding in the past, with the most significant event occurring in October 2000 (EA, 2005). In total, damage was caused to 292 residential properties and it took between 6-12 months for people to be able to return. Post event reviews revealed insurance to be a significant issue, with nearly half of the affected population lacking either contents or buildings insurance (EA, 2005). Further flooding has since been

caused by localised storm events (e.g. July and August 2003; CBMDC, 2005). These events sparked an independent enquiry into water management within the Bradford district which highlighted the importance of joined-up working, information sharing and need for community engagement to "*engender an awareness of ownership of responsibilities for dealing with risk and mitigations"* (CBMDC, 2005). The Flood Local Action Plan (FLAP) emerged from this enquiry, which sought to promote and support the formation of local community groups and community involvement in flood issues (Cashman, 2009). Funding cuts and perhaps a lack of interest amongst participants, has meant that many of these local community groups no longer exist; this includes the community flood action group that was established in this case study. Flood defences were installed in response to the significant flooding in 2000 and included levee systems and reinforcements to the river channel, based on the 100 year event (CBMDC, 2005). However, the area remains susceptible to *surface water* flooding which has been identified as an increasing problem (EA, 2010b).

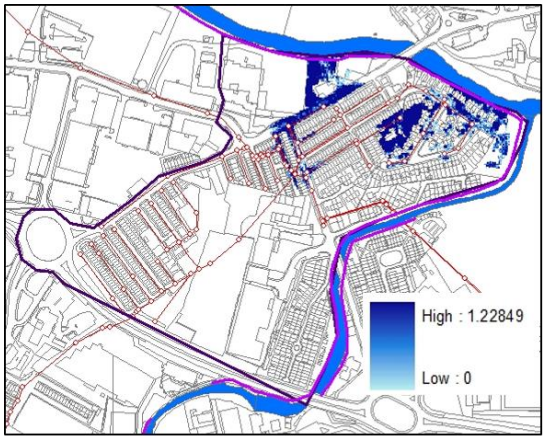
This study site has featured in existing research. Action research conducted through the Environment Agency (EA) and Oxford Brooks University was conducted between January 2002 and March 2004; working with the local community and the Neighbourhood Development Group (NDG), as well as other professional stakeholders (EA, 2005; Wilkinson and Colvin, 2005). The research focused on the lessons to be learned from the experience and recovery period of flooding, with particular attention towards stakeholder engagement. The research highlighted a number of important findings, such as the importance of quality aftercare in development and maintenance of ongoing relationships between the local community and key agencies. "Catchment consciousness" was also displayed amongst stakeholders and demonstrated a desire to understand region-wide, systemic causes of flooding to inform solutions. A central recommendation from this study, related to the need to build "bridging social capital" to expand the networks between communities and agencies, both within and across local authority boundaries.

Further EA-related research has been conducted by Thrush et al. (2005) in the context of "flood warning to vulnerable groups". Key informant interviews (including emergency professionals) elicited perspectives on flood vulnerability and warning, and accounts of the 2000 flood event in this area. Social groups listed as vulnerable to flooding and most likely to struggle with flood preparations included the elderly, disabled, young families and people living alone. With regards to flood warning specifically, the deaf and ethnic minorities were

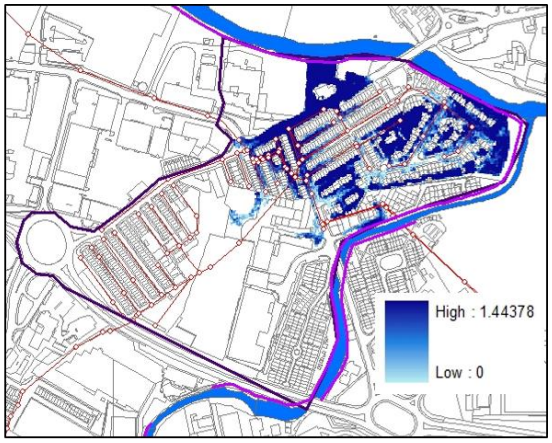
identified as disadvantaged groups; for instance, one informant discussed how EA information in other languages is distributed on request only and also said that the local Asian radio station refused to broadcast the flood warning. Language and cultural divisions were also evident in rest centres, and informants suggested that 'asking for help' is not a cultural norm in the Asian population. Although this piece of research went on to examine how vulnerability is experienced amongst vulnerable groups, this case study was not used for this qualitative phase of Thrush et al.'s research due to a poor response rate amongst residents. This was explained by recruiters as a lack in public interest, reluctance to dwell on negative past experience and feeling that little would come of any further research.

Numerical flood modelling of surface water and pluvial flooding has also been conducted for this area (Chen et al., 2009: 2010; Diaz-Nieto, 2012). Research conducted by Chen et al. (2010), under the auspices of the Flood Risk Management Research Consortium (FRMRC), applies an integrated 1D-2D model (SIPSON-UIM) to examine the interaction and flood dynamics between surface and sub-surface flow paths. Whereas SIPSON is a 1D hydraulic model for flow routing in the sewer system, UIM is a 2D non-inertia model for simulating overland flow. These models are coupled via discharge through manholes to reflect drainage and surcharge flows; the latter of which occurs when the capacity of the drainage system is exceeded during storm events and results in pluvial flooding. The spatial distribution of flooding has been modelled for various combinations of rainfall-runoff intensity and duration, and modelled with and without the presence of flood defences[20]. Additional scenarios have also examined the resulting floods for levee breach situations and overbanking of flood defences. The results for four different scenarios are presented in Figure 3.6 and illustrate the concentration of surcharge in local depressions; particularly in the east of the catchment where the terrain has a lower elevation and levees block the natural drainage paths to the river. Chen et al., also examine the main mechanisms for flooding and show that most of the study area is exposed to both fluvial and pluvial flooding (Figure 3.7).

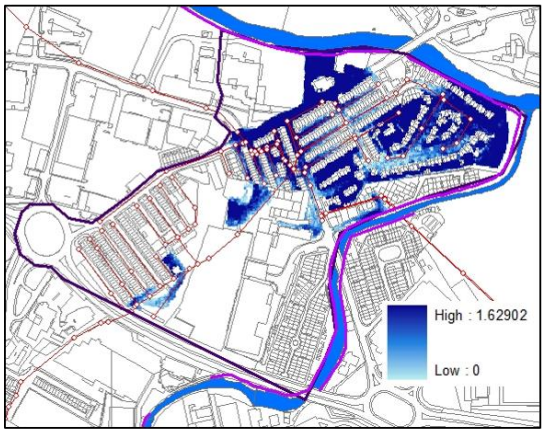
[20] Existing flood defences in the area operate with exit flap valves, which open or close depending on the river level. When the river is not in flood, valves are open and water from surface water sewers is able to exit into the river; however, in times of fluvial flooding these valves close to prevent the conveyance of water from the river into the sewer network. This inadvertently heightens the risk of pluvial flooding in the area. The modelling presented in Figure 3.6 assumes that these flap valves are closed (i.e. the river is in flood).



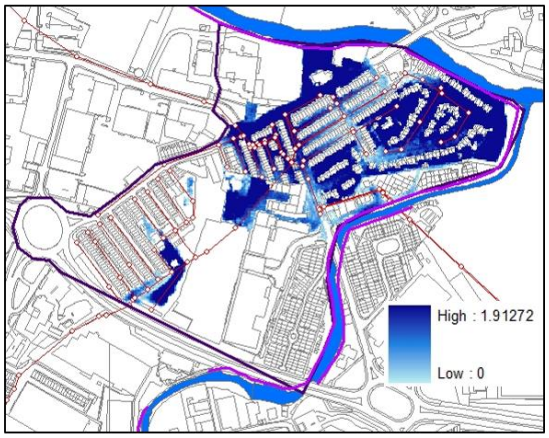
2 year pluvial event, 60mins (max depth, m)



10 year pluvial event, 60mins (max depth, m)



30 year pluvial event, 60mins (max depth, m)



100 year pluvial event, 60mins (max depth, m)

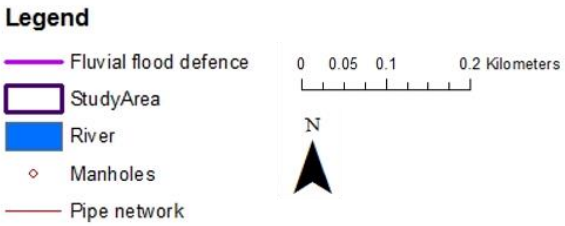


Figure 3.6: The results of 1D-2D pluvial modelling, with fluvial flood defences in place (conducted under the auspices of FRMRC, data supplied by Chen et al., 2010)

Figure 3.7: Main drivers of flooding in the Bradford case study (from Chen et al., 2010)

3.4.2 ISLE OF WIGHT (IOW) CASE STUDY

Geographical setting

A flood-prone urban catchment was also selected on the Isle of Wight (IOW), near Hampshire. The IOW is separated from mainland UK by The Solent and is approximately 23 miles diameter from east to west, with a population of 138,265 people (based on 2011 census). More than half of the Island is listed as an Area of Outstanding Natural Beauty, with almost 30 miles of designated heritage coastline and 43 Sites of Special Scientific Interest (EA, 2010c). The Isle of Wight is essentially divided east-to-west by the Medina River and geologically divided north-to-south by a range of Chalk Downs. The study area selected for this research is located in the north-west of the Island, with a local topography of steep and gentle slopes, and areas of flat land particularly along the sea front.

Social setting

In social terms, the IOW is renowned as a retirement location, with the retired population accounting for 23.8% of the total population for the Island and 11.4% aged over 75 years (Hampshire and IOW LRF, 2013). This perhaps explains the higher than average figures for the percentage of the population suffering with a limiting long-term illness (10.3% listed as 'limiting a lot' as of the 2011 census). Aside from its aging population, the Island is also subject to higher than average levels of unemployment for the South East (4.4%, compared to 3.4% average, according to 2011 census data). In contrast to the Bradford case study, the proportion of the ethnic minority populations is also one of the smallest in England with 94.8% of the overall population identified as White British. Furthermore, the IOW is recognised as an attractive holiday location, with tourism constituting a significant part of the local economy, and is also popular amongst the yachting community; overall 3.82% of properties in the study location are listed as second residences or holiday homes (based on 2001 census).

The case study town selected for this research is acknowledged as a significant waterside community, supporting the marine service industry, recreational activities, commercial business, tourism and maritime heritage (IOW Council, 2010). However, the area itself is diverse in terms of its social deprivation, with sub-areas nationally ranked from 6462 to 26,934 according to the Index for Multiple Deprivation (IMD) (where 1 is high deprivation, out of a possible 32,482; DCLG, 2008). The Social Flood Vulnerability Index (SFVI) also identifies areas for nationally average and higher than average vulnerability (Tapsell et al., 2002).

Flood history and flood research

Broad scale modelling conducted by the UK Environment Agency (EA) identifies the hazard boundaries for coastal, fluvial and pluvial flooding, and is illustrated in Figure 3.8. Overall, 8% of the Isle of Wight is designated within the floodplain, with 2,428 properties at risk of flooding[21] (EA, 2010c). This figure is largely attributed to tidal flooding as urbanisation is concentrated along the coastline. However, fluvial flooding also occurs in the catchments of the River Medina, Eastern and Western Yar and Monktonmead Brook (EA, 2009), and accounts for approximately 185 properties and 450 people identified as at-risk (based on the 1 in 100 year flood extent; EA, 2009). In the selected area for this research, flooding is driven by pluvial and tidal mechanisms (Figure 3.9).

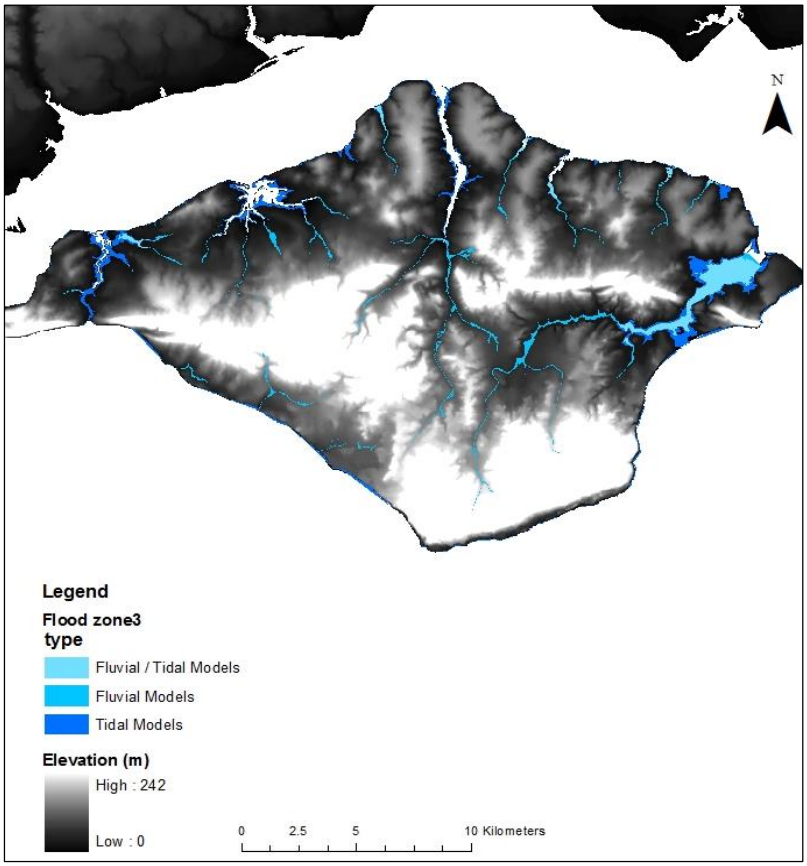


Figure 3.8: Extent of flood Zone 3 for tidal and fluvial flooding across the Isle of Wight; the probability of fluvial flooding is 1% and tidal flooding is 0.5% in any one year (Copyright © and Database rights Environment Agency 2013; some information within the Flood Map is based on digital spatial data licensed from the Centre of Ecology and Hydrology © NERC). Overlaid onto Digital Terrain Model; based on Panorama DTM, Scale 1:50,000, June 2006 and downloaded in Sept 2012 from OS MasterMap® (© Crown Copyright Ordnance Survey. An Ordnance Survey/EDINA supplied service).

[21] Occurrence of groundwater flooding is minimal on the Isle of Wight and therefore not discussed here (EA, 2010)

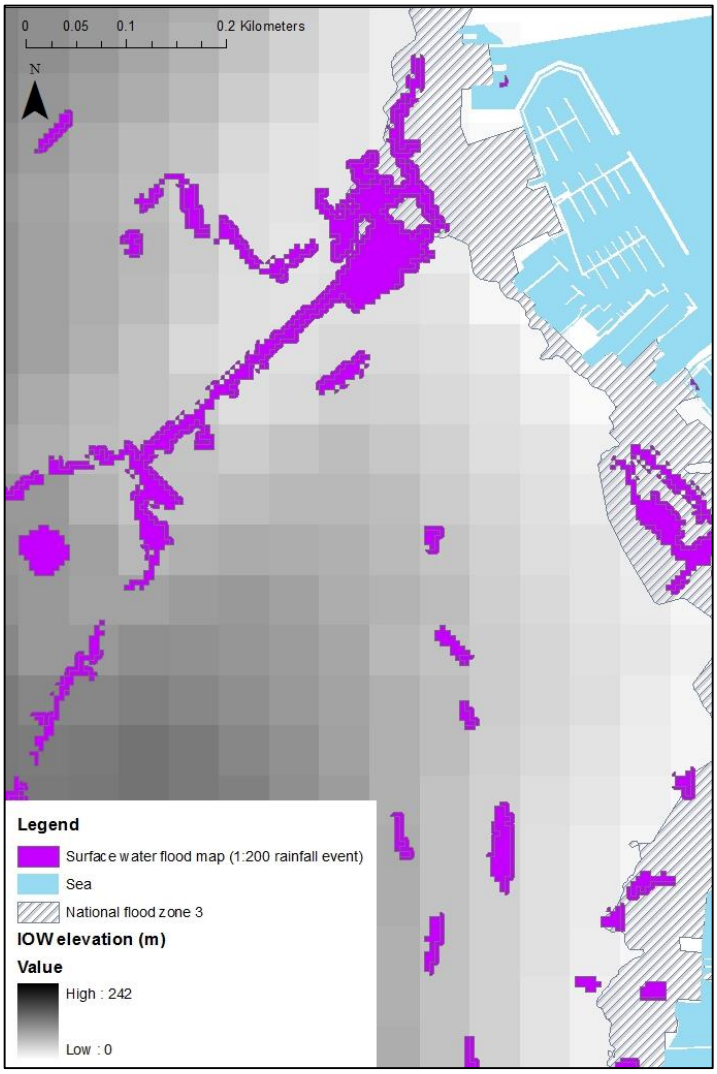


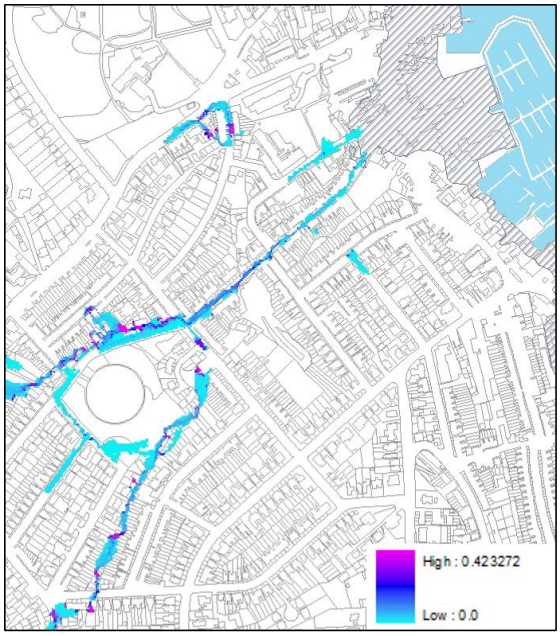
Figure 3.9: The extent of pluvial flooding in the selected case study area, obtained from the Flood Map for Surface Water (1:200 rainfall event); overlaid with 200 year flood boundary for tidal flooding (Copyright © and Database rights Environment Agency 2013; some information within the Flood Map is based on digital spatial data licensed from the Centre of Ecology and Hydrology © NERC).

The study location selected for this research has historically flooded during periods of the high spring tide, resulting in overtopping of the sea wall (IOW Council, 2010). In addition, the town is built on a topographic high, which results in fast flowing overland flow at times of heavy rainfall and surface water accumulation, especially along the main high street of the town. When combined with a high tide this has resulted in significant flooding, with more recent events occurring in 2000, 2004, 2006 and 2008. The catchment area is served by a combined sewer network and there are a number of 'hotspots' where overland flows have been identified as significant mechanism for flooding (Allitt et al., 2009). Although surface water flooding is typically quick to occur and pass, and is highly localised (i.e. affecting less than 10

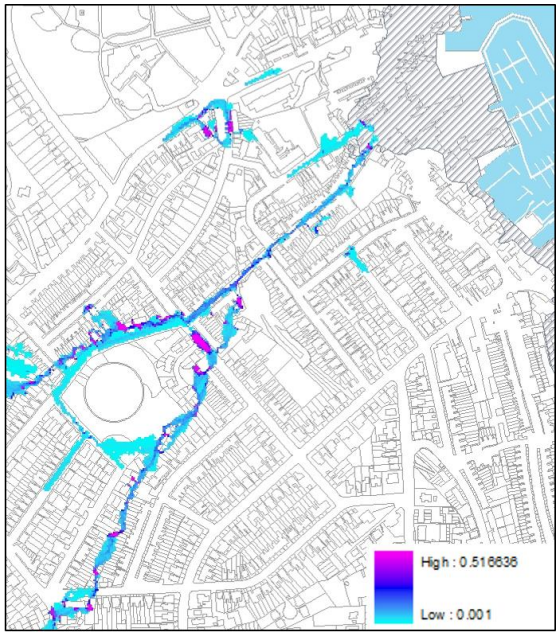
properties), the Catchment Flood Management Plan (CFMP) identifies a number of locations where this occurs (EA, 2009).

The assessment of future flood scenarios conducted as part of the CFMP, suggests that climate change (including sea level rise) and land use change will increase flood risk and frequency of flooding (EA, 2009). In terms of coastal flooding, the Shoreline Flood Management Plan (SFMP) recommends a "Hold The Line" or "Advance The Line" policy for existing flood defences, which currently including both private and publically-funded seawalls and quays (IOW Council, 2010). With regards to surface water and pluvial flooding, recent mitigation work has been completed by Southern Water to improve the drainage network in the town centre; this has included increased sewer capacity and installation of a storm storage tank (Southern Water, 2010).

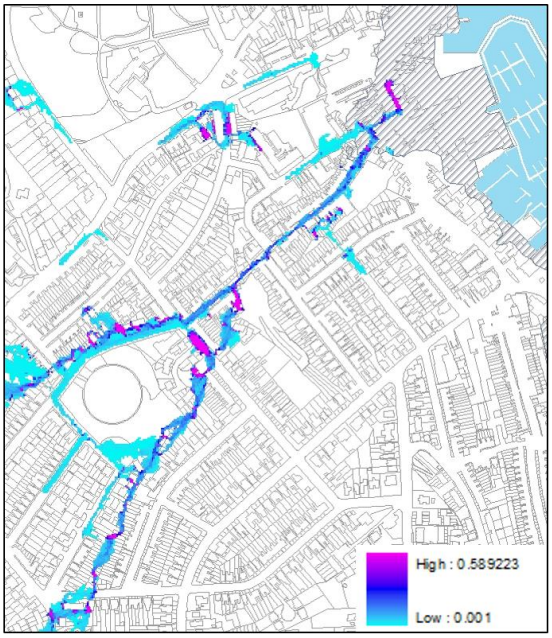
Previous research has been conducted in this location to trial the use of 1D-1D and 1D-2D modelling to capture the interactions between surface and sub-surface flow paths and spatial patterns for pluvial flooding at the local scale. Allitt et al. (2009) employ a coupled 1D-2D model to capture the flow paths through the sewer network and overland flow, respectively; the latter of which is based on the 2D module for Infoworks CS©. A number of simulations have been trialled for design storms, which are well correlated with known sites of flooding and flood records from actual rainfall events. Moreover, field observations are integrated into the model to capture the dynamics between surface features (e.g. walled entrances to properties, alleyways) that can divert or constrain flow pathways. This model also captures the pluvial runoff within the catchment, assuming no infiltration, initial losses or depression storage (Allitt et al., 2009). The results for a number of simulations are presented in Figure 3.10.



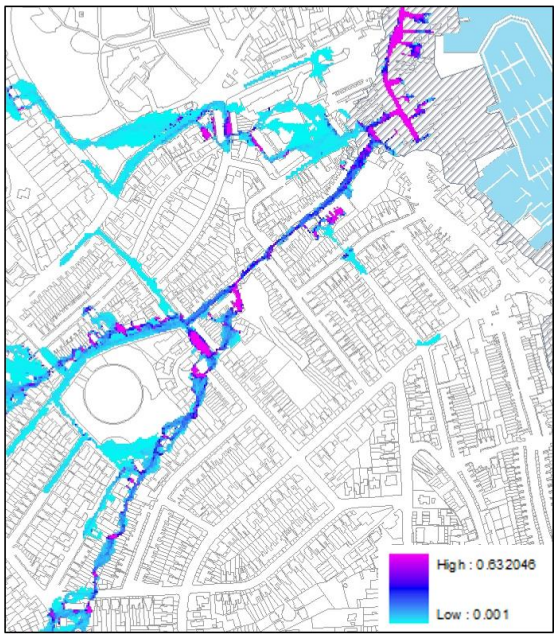
5 year pluvial event, 90mins (max depth, m)



10 year pluvial event, 90mins (max depth, m)



20 year pluvial event, 90mins (max depth, m)



50 year pluvial event, 90mins (max depth, m)

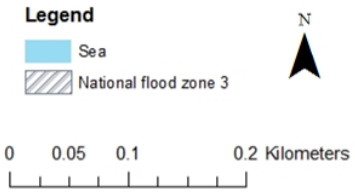


Figure 3.10: Results of 1D-2D pluvial flood modelling, conducted using Infoworks CS© with the inclusion of buildings and sewer network (conducted under the auspices of FRMRC, data supplied by Allitt et al., 2009)

3.5 RESEARCH CONTEXT

This research was partly funded by the EPSRC under the auspices of the Flood Risk Management Research Consortium[22] (FRMRC, *www.floodrisk.org.uk/*). As part of this consortium, this research was partially steered by the goals of FRMRC for interdisciplinary collaboration, and delivery of useful and useable research for practitioner end use. Available to this study were detailed, local-scale flood inundation visualisations, produced from previous 1D-2D inundation modelling developed in FRMRC and applied to locations in West Yorkshire (Chen et al., 2010) and the Isle of Wight (Allitt et al., 2009) (as described above).

Within the objectives of the Consortium, this research trialled the use of these model outputs within a GIS-based flood risk mapping tool ("KEEPER") for emergency professionals[23]. This tool was trialled firstly, to inform recommendations for professionally-tailored decision support tools in flood incident management (Alexander et al., 2011); and secondly, as a communication tool for facilitating knowledge exchange at the scientific-practitioner interface[24] (Alexander et al., 2013). In the context of this thesis, this adjacent research conducted within FRMRC remains influential in a number of ways;

I. Pluvial modelling conducted by Chen et al. (2009; 2010) and Allitt et al. (2009) partially inform the selection of case studies and sampling frame for research participants (discussed in Chapter 4)

II. Pluvial flood modelling conducted by Chen et al. (2010) and Allitt et al. (2009) inform the objective hazard boundaries contrasted with subjective constructions of hazard and risk held by residents in the selected locations (discussed in Chapter 5 and 6)

[22] FRMRC was funded by the Engineering and Physical Research Council (EPSRC) under Grant EP/FO20511/1, with additional funding from the EA/Defra (Joint Defra/EA Flood and Coastal Erosion Management R&D Programme), the Northern Ireland Rivers Agency (DARDNI) and Office of Public Works (OPW), Dublin.

[23] KEEPER – a Knowledge Exchange Exploratory tool for Professionals in Emergency Response

[24] The published paper from this research is included in the appendices

III. The GIS-based flood risk assessment tool (KEEPER) is employed as an elicitation technique to facilitate cognitive interviews with emergency professionals (discussed in Chapter 7)

It is important to acknowledge how FRMRC has partially steered the research presented in this thesis; however, and more importantly, this study is designed to address the aims and research questions outlined in Chapter 1. The thesis now turns to these methodological decisions.

Research design

Chapter 4

CONTENTS

4.1 METHODS OVERVIEW

The aim of this research is to examine the etic-emic gradient in constructions of flood vulnerability, from the perspectives of academia, emergency professionals and residents in two case studies at risk of flooding. This is accomplished through a mixed methods strategy to address the research questions outlined in Box 4.1. Academic perspectives were addressed in Chapter 2, which critically examined the literature and the extent to which vulnerability research can be aligned to an etic-emic gradient. The thesis now turns to the methodology for addressing constructions of vulnerability from the perspective of residents (Phase 1) and emergency professionals (Phase 2). This is described in two phases and separated in this thesis for ease of reading. The overall design of this research is illustrated in Figure 4.1.

BOX 4.1: Research Questions (RQ)

1. How is vulnerability constructed and experienced by residents in locations at risk of flooding? What are the variables influencing self-declared vulnerabilities? What are the implications of self-declared vulnerabilities?

2. How is vulnerability constructed by emergency professionals? How do these constructions shape identities of vulnerability and professionals' expectations of people's ability to respond and recover from flooding?

3. Is it possible to infer degrees of "insiderness" and define insider-outsider boundaries amongst research participants? To what degree does *insiderness* influence constructions of vulnerability and declarations of vulnerability? Can these be aligned to the etic-emic spectrum?

This chapter focuses on Phase 1 and the research methods employed to elicit residents' constructions of flood vulnerability. Phase 2 of this research is presented in Chapter 7 and 8. Although initially handled in isolation, these phases are brought together in Chapter 9 to fully explore the possibility (and appropriateness) of inferring insider-outsider boundaries amongst research participants and the extent to which this influences constructions of vulnerability.

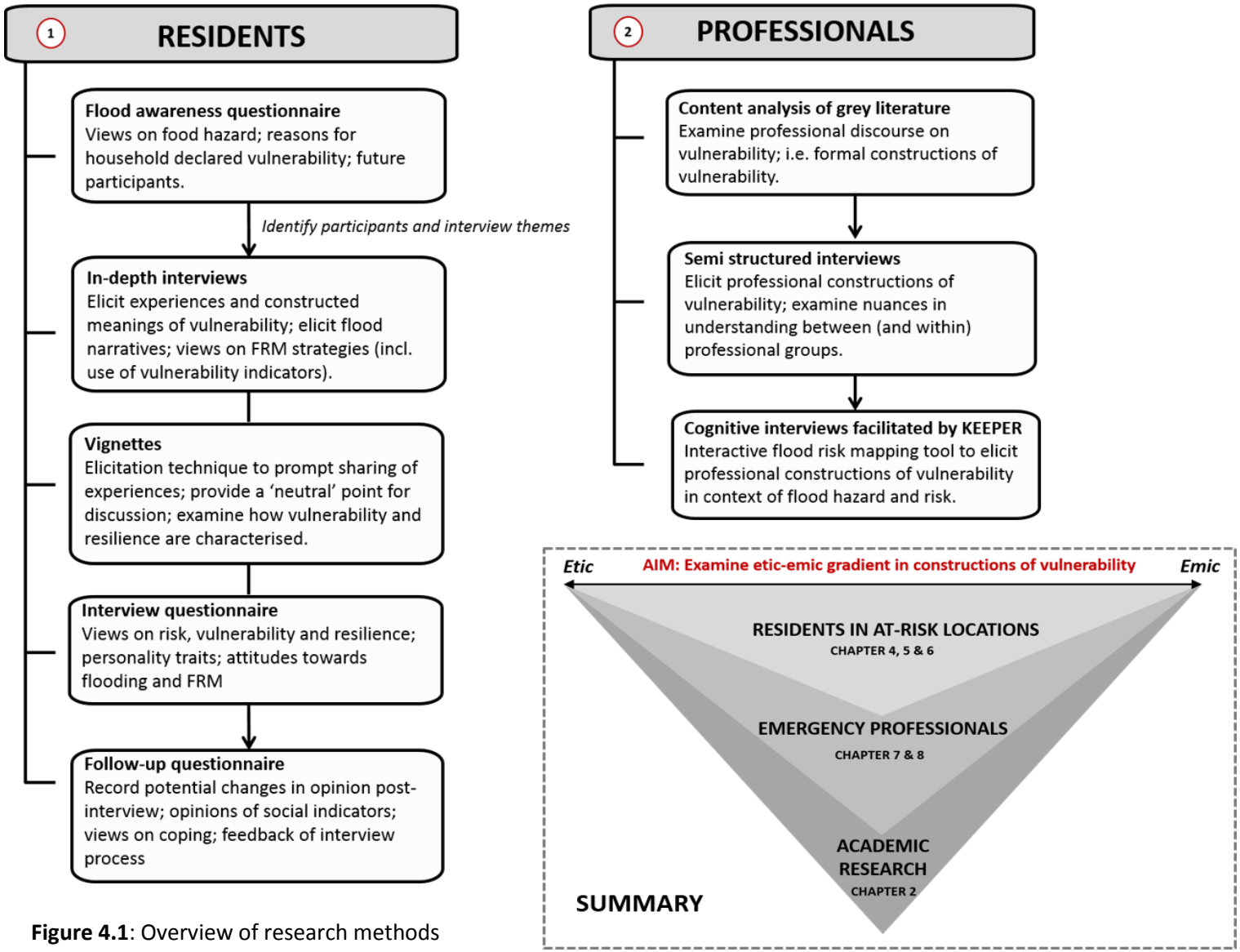


Figure 4.1: Overview of research methods

4.2 THESIS PHILOSOPHY

This thesis tries to adopt a meta-view that straddles the etic-emic debate. Instead of assuming the supremacy of one perspective over the other, this thesis consciously reflects on the gradient between the two and its value for understanding flood vulnerability. This meta-view is reflected in the range of methods employed in this research, which partially stretch across the etic-emic spectrum (as discussed in Section 2.4.3). These methods conceptually create different 'distances' between the researcher and the researched and thus provide different perspectives on the research questions addressed in this thesis.

To some extent, the use of different methods results in the adoption of the different rhetoric attached to these. As the reader will observe, this is particularly apparent in reading Chapters 5 and 6, which shift from quantitative to qualitative inquiry respectively. However, the research is fundamentally approached from a *social constructivist* perspective to examine how vulnerability is constructed, contested and negotiated by emergency professionals and residents in flood prone locations; as well as in research itself (see Chapter 2).

In contrast to positivistic realism, social constructivism upholds a standpoint of interpretive relativism and "*assumes the relativism of multiple social realities, recognizes the mutual creation of knowledge by the viewer and the viewed, and aims toward interpretive understanding of subjects' meanings*" (Charmaz 2000:510). Essentially, constructivism assumes that the beliefs and meanings people create and use, fundamentally shape what reality means to them (Neuman, 2006). This perspective therefore, contests the assumption that knowledge can be objectively discovered in the pursuit of a universal truth and single reality; instead, acknowledging the role that individuals play in constructing "*the realities in which they participate"* (Chamaz, 2006: 187). From this perspective, the "*privileged vantage point of the researcher*" is challenged and research interpretations considered to be another form of constructed reality (McLaughlin and Dietz, 2008; see further discussion in Section 2.2.1). In the context of this research, it is hypothesised that vulnerability is understood and experienced differently from the different perspectives of participants selected for this study. Moreover, it is assumed that these perspectives can be elicited through a *pragmatist* approach to mixed methods.

4.3 A MIXED METHODS STRATEGY

Mixed methods is a research strategy that has been hotly debated through epistemological and ontological positions, and from concerns surrounding the practical feasibility of combining data and findings from the seemingly opposing paradigms of qualitative and quantitative methods[25]. The purpose of this section is to position this research within the broader debates of mixed methods in social inquiry and justify the mixed methods design of this research.

The typical attributes of quantitative and qualitative research methods are summarised in Table 4.1. Arguments in support and opposition of mixing methods are presented from three different perspectives; the purists, situationalists and pragmatists. *Purists* assert that methods are epistemologically-rooted and occupy polarised spaces of ontology, axiology[26] and logic; therefore, methods are inherently incompatible and mutually exclusive (Howe, 1988). This perspective often ignites tensions of methodological supremacy and sparks a rift between quantitative versus qualitative research (e.g. see debates in geography by Johnston et al., 2003 and Hamnett, 2003). Although *situationalists* uphold the purist view uniting epistemology and method, they argue that methods can be analysed within their paradigmatic parameters and joined in the pursuit of knowing more. This perspective makes no claims of supremacy, but rather asserts that different methods are more appropriate for certain situations (Onwuegbuzie and Leech, 2005).

[25] *Epistemology* is concerned with philosophical enquiry into the nature and scope of human knowledge; whereas *ontology* concerns the nature, properties and relations between all beings, things and substances there are in the world (Benton and Craib, 2001).
[26] Axiology refers to the theory of values and value judgements (Benton and Craib, 2001).

Table 4.1 The classical distinctions between the quantitative and qualitative research methods (after Creswell, 2009: Bergman, 2008; May, 2001)

	Quantitative research methods	**Qualitative Research Methods**
Epistemology	Positivism/post-positivism	Constructionist/ interpretivism
Ontology	A single reality or truth that can be discovered ('social facts')	Reality is constructed, can be multiple or non-existent: there is no one truth
Axiology	Objectivity and value-free research	Research is not value-free: subjectivity
Logic	Deductive reasoning via falsifying principal and hypothesis testing	Inductive and exploratory enquiry
Role of the researcher	Detached to avoid bias	Researcher immersed in phenomenon/social setting
Generalizability	Possibility to generalise research findings	Context-specific: impossible to generalise findings
Causality	Seek to identify and establish cause and effect and universal causal laws	Unable to deduce cause and effect relationships
Sample	Large, representative samples Typical methods employed: large-scale social surveys where responses are represented/transformed into numerical values, statistics – correlation and significance testing: Results are calibrated and validated.	Small, non-representative samples Typical methods include: in-depth interviews, participant observation, ethnography, discourse analysis

The research conducted within the scope of this thesis is aligned to a pragmatist perspective and adopts the standpoint that research methods can be mixed at a practical and epistemological level for understanding the multi-layered nature of social phenomenon. While a strong association exists between methods and epistemology, paradigmatic attributes are not fixed or inherent to research methods; therefore, methods can be conceived as practical tools (Tashakkori and Teddlie, 1998). Indeed, Bergman (2008) lists a number of examples which seemingly 'break the rules' of conformity. Similarly, Fielding and Fielding (2008) consider how flood risk awareness surveys can capture "insider" views on risk, whilst enabling large sample sizes and statistical analysis. Others have also argued that a *false dichotomy* exists (Sheppard, 2001; Onwuegbuzie and Leech, 2005). Such debates demonstrate that an etic-emic gradient in research methods depicted in Figure 2.4 in Chapter 2 commonly exists.

Research methods may in themselves be described as etic or emic methods, depending on the orientation of the research. Instead of debating mixed methods from the perspective of quantitative and qualitative paradigms, Fielding and Moran-Ellis (2006) argue that the

"*emphasis on the data as numbers and texts obscures the differing perspectives*". These authors advocate the etic-emic framework for mixed methods for several reasons; namely to support theoretical framing for the use of mixed methods and in justifying the relationship between methods and research questions, and between methods themselves. However, authors in other disciplines have highlighted the tendency for researchers to employ the etic-emic distinction without conscious reflection about how this informs selected methodologies (Jahoda 1977: Lonner, 1999). To address this critique, Figure 4.2 illustrates how the research methods (previously outlined in Figure 4.1) are aligned across the etic-emic gradient and related to the research questions posed in this thesis.

In general terms, mixed method research is conducted for multiple reasons, which in turn shape the way in which methods are sequenced and integrated, and the epistemological status of resulting knowledge. Multiple aims are evident in the literature, such as to;

- Corroborate research findings – enhance validity and confidence in research findings
- Inform the design of the 'other' – for instance, qualitative research is often used to reveal themes for questionnaires.
- Increase breadth and/or depth of data – e.g. qualitative research is often described as adding 'flesh to the bones' of quantitative data.
- Theoretical integration – reveal multifaceted and complex nature of social phenomenon

In the literature a number of 'mixing' techniques are proposed and a confusing terminology is presented; such as terms for combining methods, triangulation, integration, corroboration and elaboration (see review by Moran-Ellis et al., 2006). This research adopts the strategy of *integration*, which is defined by Moran-Ellis et al. (ibid) as both a practical and theoretical approach for relating methods, data and findings. From a theoretical standpoint, it is argued that multiple perspectives are required to reveal social phenomenon in its multi-layered entirety. Crucially, in the approach adopted in this thesis, equal weight will be attributed to each method and the resulting knowledge. From a practical perspective, this will be achieved through a technique whereby data from individual methods are firstly analysed within the parameters of the paradigm and then brought together at the stage of interpretation; thus maintaining the characteristics of each data type and creating a constellation of findings geared towards a shared research question (Moran-Ellis et al., 2006). Whilst this method can

serve as a strategy for triangulation and enhance the credibility of the research findings, it also forces the researcher to critically examine contradictory findings. This method for essentially tracing findings from one method through the data of another, is referred to as the "*follow the thread*" technique (Moran-Ellis et al. ibid). In this study, several research methods are used to elicit and examine constructions of vulnerability and this "*follow the thread*" technique for data analysis and interpretation will be applied.

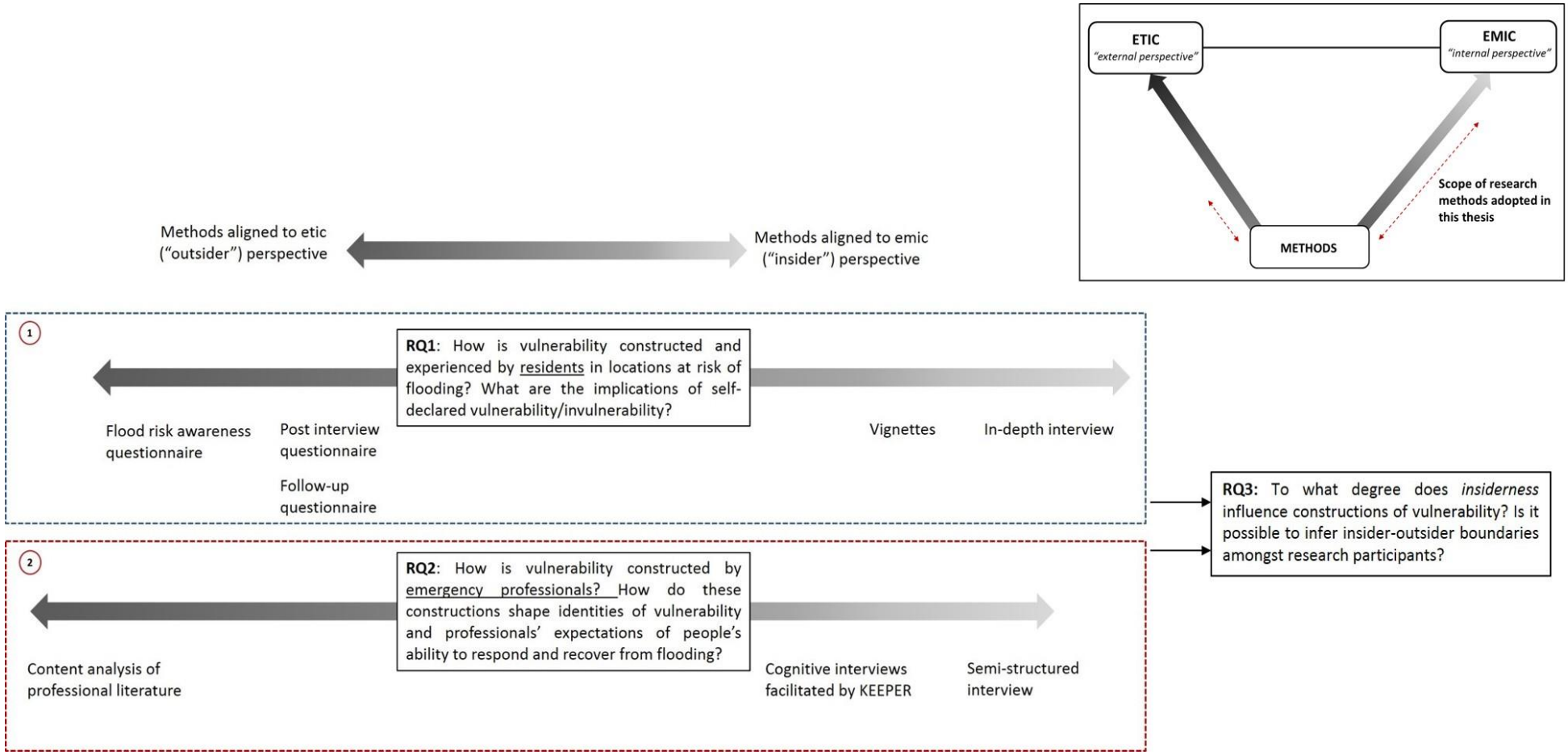


Figure 4.2: Linking research questions to methods, and method to the etic-emic gradient presented in Chapter 2 (Figure 2.4)

4.4 SAMPLING

This research was conducted in two UK case studies, namely a Bradford town in West Yorkshire and a town on the Isle of Wight. For ethical reasons, the names of these towns are not disclosed in this thesis; the reasons for this are fully discussed in Section 4.7. The geographical, social and flood contexts of these locations were outlined in Chapter 3. This section addresses the methodological decisions which informed the selection of these study locations and the sampling strategy within these locations to encourage resident participation for Phase 1 of this research. Sampling for Phase 2 of this study is discussed in Chapter 7.

4.4.1 SELECTION OF CASE STUDIES

The selection of locations was partially steered by the availability of detailed local-scale pluvial flood modelling developed within the Flood Risk Management Research Consortium (FRMRC); through which this research was also affiliated (see Section 3.4). The availability of these data enabled detailed mapping of the spatial pattern of pluvial flooding. This was accompanied by broad-scale indicative mapping for surface water available through the Environment Agency (EA), which records the overland flow pathways for two storm likelihoods (i.e. 1:200 and 1:30 year chance of occurring per year). The main limitation of the Flood Map for Surface Water is its reliance on a single national average figure for drainage capacity (EA, 2013). Therefore, the numerical modelling completed within FRMRC (Allitt et al., 2009; Chen et al., 2010), can be regarded as a more sensitive and realistic representation of the interaction between surface and sub-surface flow paths at the local scale. Moreover, the model outputs provided to this research included a range of scenarios; from frequent low impact, to infrequent high impact events. In addition, these data were supplemented with tidal (IOW) and fluvial (Bradford) floodplain mapping, also available through the EA.

Collectively, this supported detailed mapping of the different types of flooding that the selected locations are exposed to; namely fluvial and pluvial flooding in Bradford, and tidal and pluvial flooding in the IOW case study. This provides an opportunity to examine residents' constructions and experiences of vulnerability in the context of different flood etiologies. Furthermore, it enables the research to compare and contrast these subjective constructions with the hazard boundaries delineated through objective science; thereby, facilitating insight into the notion of an etic-emic gradient. These locations were thus purposively selected as the

most appropriate locations for addressing the aims and research questions presented in this thesis (Creswell, 2009).

It is also noteworthy that both locations are defended against fluvial and tidal flooding. In the Bradford case study, fluvial flood defences were recently installed in 2005 (Section 3.4.1). This may profoundly influence residents' constructions of flood vulnerability and potentially limit participation, as well as insight into nuances within constructions, if participants firmly believe that they are no longer at risk of flooding. However, the Bradford location in particular poses an interesting study into how constructions of vulnerability manifest in the context of an apparently defended place. Moreover, both case studies can shed light on people's understanding of vulnerability within the context of urban flooding (i.e. pluvial, surface water), which has been somewhat under-researched to-date, yet has been identified as an increasing problem for the UK (Chapter 1).

These locations were also purposively selected for their differing social settings (outlined in Chapter 3). This enables the research to examine the influence of different socio-demographic characteristics upon constructions of vulnerability. In addition, Chapter 3 describes the *area vulnerability* of these locations deduced from the Social Flood Vulnerability Index (i.e. an informed-etic approach; Section 2.5), which maps these areas as having both similar and dissimilar categories of vulnerability (Tapsell et al., 2002). Both locations include zones of 'average vulnerability', but whereas the Bradford town also occupies zones of '*low vulnerability'*, the IOW town includes zones of '*high vulnerability*'. From this, it is possible to examine how constructions of vulnerability are varied within and between these etic-informed categories, to reveal the potential heterogeneity within.

It may be regarded as a shortcoming that the local-scale focus means that findings and interpretations may not be applicable to other contexts, such as non-defended places, or non-UK settings. Although it is not be possible to generalise from the cases, case studies need not be conceived as mere stepping stones towards further research; indeed, Flyvbjerg (2006) argues that case study research can provide exemplars for understanding and are an important contribution to social science. In agreement with Flyvbjerg, this thesis does not discount the valuable contributions that are made from other research strategies and argues that all forms of research methods are required to expand the breadth and depth of knowledge. However,

the case study approach was deemed the most appropriate strategy for eliciting the depth requested in the aims and research questions of this study.

4.4.2 SAMPLING WITHIN THE CASE STUDIES

The mapping of available flood data from FRMRC and the UK Environment Agency, was used to inform the sampling frames (i.e. study area) within the selected case studies. A larger sampling frame was used in the Isle of Wight (IOW) study (ca. 1.2km^2), where detailed pluvial modelling was completed for a wider spatial area and flooding more spatially distributed by comparison to the Bradford location (ca. 0.4km^2). In both locations, the hazard boundaries from infrequent high impact design storms were mapped, based on the 1 in 100 year design storms simulated for the Bradford and IOW studies (Allitt et al., 2009; Chen et al., 2010). This decision was made in order to capture all households potentially exposed to pluvial flooding. Whilst these hazard boundaries largely inform these sampling frame, residents were also purposively sampled outside these boundaries. This strategy enables a fuller exploration of the extent to which an etic-emic gradient (or "insiderness") is evident in residents' constructions of vulnerability. In satisfying this research aim, *range* sampling[27] was used to elicit participation from the following groups, for which degrees of "*insiderness*" are likely to vary (Figure 4.3):

- Residents located within and outside objective boundaries for flood hazard (as identified through numerical flood modelling)
- Flood experienced and inexperienced residents
- Residents aware and unaware of flood risk
- Range of socio-demographic characteristics

Whilst the sampling frame was purposively designed, every household within this spatial boundary was contacted and had an equal opportunity of being part of the sample. In this instance, there was no mathematical calculation of randomness, rather the population themselves self-selected participation. It is important to remain mindful of the bias that this may create, for instance people who have experienced flooding are more likely to participate than those without this experience (Fielding and Fielding, 2008). In reality, the reverse to this

[27] Range sampling is a strategy which deliberately seeks a range of participants to capture the possible heterogeneity in opinions and facilitate comparative analysis. This is a non-probability sampling method that is justified by the criterion "fit for purpose" and is not based on random selection of participants as in probability sampling, which is designed to be statistically representative of the general population. Instead, participants were purposively sampled to best answer the research questions of this study (May, 2001).

statement was encountered in Bradford and some of those who had experienced significant flooding in 2000 did not wish to participate in this research; one resident had the view that "*it's all in the past, we don't want to go back there*". The implications of self-selection bias and the challenge that this presents emic-orientated research in general, is returned to in Chapter 9.

Another source of bias originates from what is referred to here, as *research fatigue*. This was observed in the Bradford case study, which has been subject to a couple of research studies since experiencing flooding in 2000 (Thrush et al., 2005: Diaz-Nieto, 2012). Consequently, some residents remarked that they had previously participated in research and had not had any form of debriefing to explain the outcome of their contributions. Whilst some still consented to participate in this study, others were unwilling to participate again. The implications of this are considered in terms of ethical research in Section 4.7, and also returned to in Chapter 9.

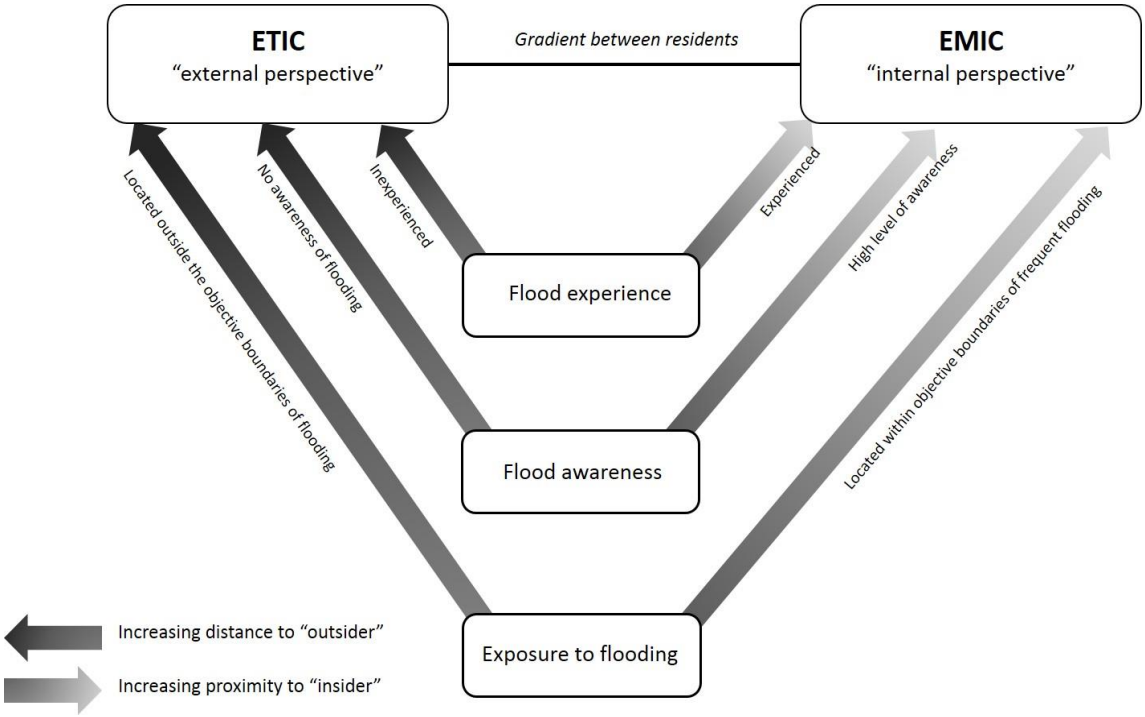


Figure 4.3: Conceptualising etic-emic gradient for range sampling of resident participants

4.5 ELICITING PUBLIC CONSTRUCTIONS OF VULNERABILITY

Phase 1 addresses the construction of vulnerability from the perspective of residents in the selected locations and the variables influencing declared vulnerabilities. For the purpose of this thesis, ***'self-declared vulnerabilities'*** are defined as the participant's view of his or her degree of vulnerability towards flooding; where the individual may consider themselves to be either vulnerable, not vulnerable or somewhere in between.

A number of methods were employed and analysed using quantitative and qualitative research methods; as outlined in Figure 4.4. Although these methods were administered in sequence, for ease of reading, questionnaire methods are grouped in Section 4.5.4; therefore, this section begins by evaluating the qualitative methods employed in this research. Collectively, these methods were designed to answer research questions 1 and 3, as follows;

> **RQ1**:- How is vulnerability constructed and experienced by residents in locations at risk of flooding? What are the variables influencing self-declared vulnerabilities? What are the implications of self-declared vulnerabilities?
>
> **RQ3**:- Is it possible to infer degrees of "insiderness" and define insider-outsider boundaries amongst research participants? To what degree does *insiderness* influence constructions of vulnerability and declarations of vulnerability? Can these be aligned to the etic-emic spectrum?

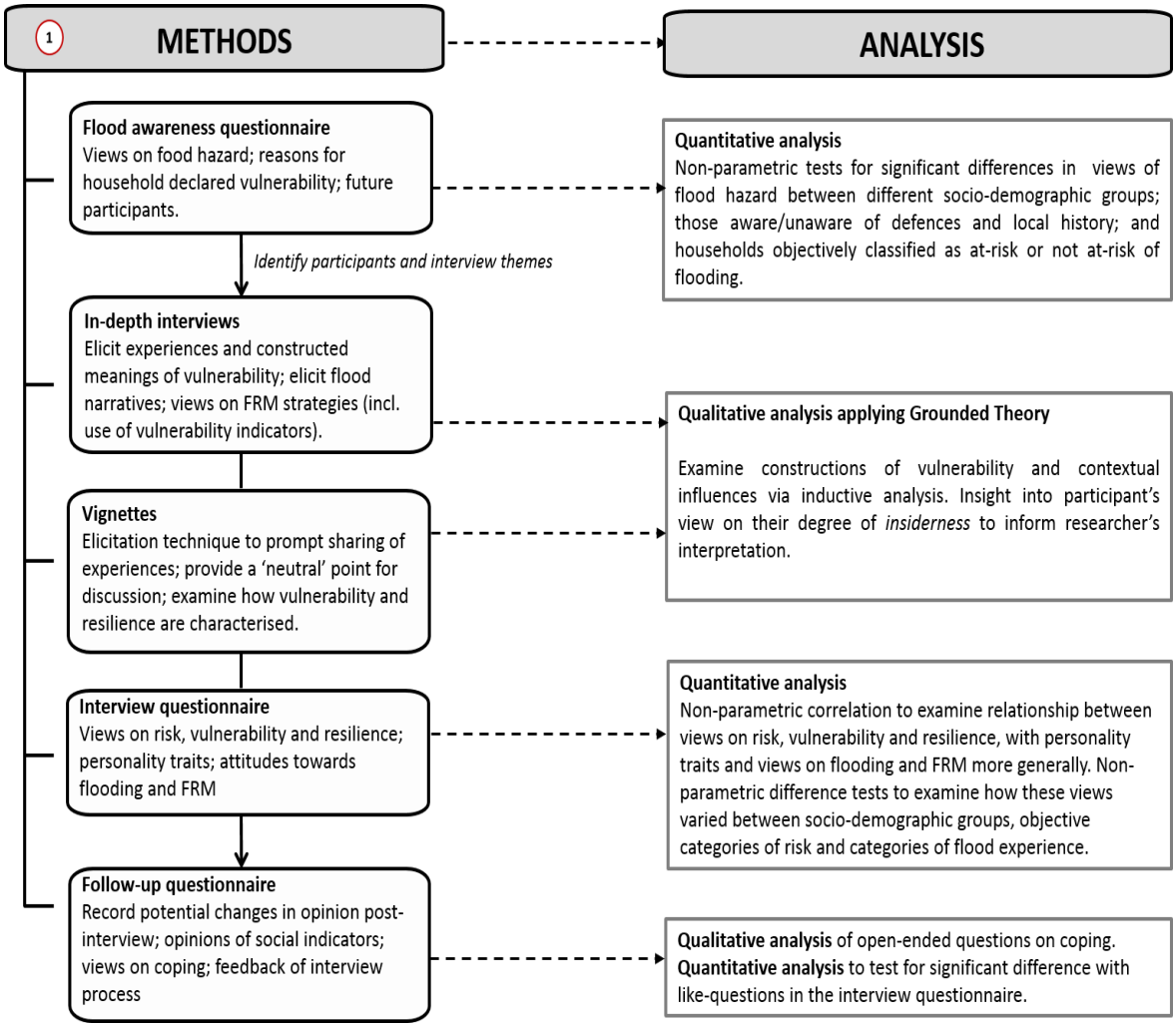


Figure 4.4: Summary of research methods and analysis conducted in Phase 1

4.5.1 IN-DEPTH INTERVIEWS

In-depth interviews were conducted as the primary method for eliciting constructions of vulnerability held by residents. Interviewing can be regarded as an *emic-orientated* research method, as it allows exploration into the meanings and experiences of the research participant, and facilitates analysis of social phenomenon from the "insiders" point of view (Bryman, 1984). Interviews were steered by a series of research themes and some pre-set questions to help orientate discussions; yet still allowing participants the time to narrate their personal experiences and feelings in their own sequences and terminology. This also enabled participants the opportunity to digress and share their thoughts on topics they themselves deemed relevant (Silverman, 2000).

Arguably all forms of social interaction are structured between speakers, regardless of whether the interviewer intentionally seeks this or opts for a non-structured interview (Hammersley and Atkinson, 1983). The interview represents a *construction of reality*, co-created between the interviewer and interviewee, and shaped by the context in which this interaction occurs (Fontana and Frey 2000:663). The interviewer is not neutral, objective and value-free in this process as argued in the *realist* epistemology, but is an active participant in the social interaction that takes place (Silverman, 2000: Charmaz 2000, p510). The interviewer is required to be a skilled conversationalist and empathetic listener and in doing so, can target questions and phrasing in a context-sensitive way (Eyles, 1988). There are a number of potential sources of bias related to self-presentation, commitment and the status of interviewer/interviewee (May, 2001). However, the dialogue created through the shared experience of 'the interview', aims to minimise these and account for the insiders' perspective as accurately as possible.

Interviews were conducted with individual participants, representative of the household, though in some cases participants were accompanied by their partner or child as they preferred. Whilst participants were offered the opportunity to be interviewed elsewhere, all participants opted to be interviewed at home. As observed in other research, the advantage of this is that it enabled participants to describe their experience of flooding within the context it occurred and use visual landmarks to point out characteristics of the flood, such as depths, flow pathways and pools of water (Coates, 2010). Each participant was assigned a unique ID to ensure anonymity and support the referencing process of quotations; for example, a quote taken from interviewee 1 is referenced as "*Int 1*". Overall, twenty seven interviews were conducted in the Bradford study and thirteen interviews in the IOW study, with a total of forty seven interviewees[28].

Where possible, each interview began with a discussion about the local area, why the participant chose to move there and their likes and dislikes about living here. Although this topic is somewhat diverted from the questions of this research, discussions on place were used to help ease participants into the conversation style of the interview and familiarise the interviewee with the interviewer. Moreover, the importance of evaluating flooding within the context of daily life, and other local issues, was highlighted in the literature review and was therefore, regarded as an important contextual topic for understanding residents' views on

[28] The total of 47 interviewees includes all those who contributed to the interview; including those who made only minor contributions in cases where more than one participant was involved.

flood vulnerability (e.g. Fordham, 1998; Cannon, 2000; McIvor and Paton, 2007). Whilst it was the intention to begin each interview with a discussion about place, some participants immediately shared their experiences of flooding. Rather than break the flow of this discussion, the theme of place was questioned further into the interview. Flood narratives were an essential feature in qualitative analysis for they shed light on the experience and emotions encountered both during and in the months to years following a flood event.

During the interview process, participants were asked whether they consider themselves to be at *risk* of flooding, and then whether they would consider themselves to be *vulnerable* to flooding. Vulnerability was also questioned in a hypothetical event and participants asked to consider if they might consider themselves to be vulnerable in that situation and why. Whilst reliance on hypothetical discussions can be somewhat limited (e.g. Barter and Renold, 2000), this strategy was designed to prompt self-reflections on vulnerability, and reveal the nature and basis of these constructions. The importance of providing a scenario for participants to appraise their personal vulnerability and strategies for coping, was highlighted in the reviewed psychology research in Chapter 2 (Grothmann and Reusswig, 2006). In addition, participants were asked to consider *who* they might consider to be vulnerable in a flood situation and why. This latter decision was informed by the research conducted by Moran-Ellis et al. (2006; 2007), which revealed that merely asking respondents to comment on their vulnerability is likely to be met with replies of 'it's not us, it's them' as respondents place the term within their socio-cultural frames of what constitutes a vulnerable person. This was explored in further depth during the interview process of this study (and reported in Chapter 6).

Participants were not explicitly asked for their definitions of these terms, but explicit and tacit understanding and meaning assigned to these concepts were examined through interviews. It was initially intended that vulnerability should be firstly presented as a stand-alone term in order to gauge the range of meaning and understanding amongst participants; however, participants often requested some form of clarification and prompt. Therefore, vulnerability was qualified in terms of some who might struggle and need some form of support, either during or in the months following a flood. In turn, participants were asked who and what they considered might help people to be resilient to flooding; where resilience was defined by the ability to cope (during and following flooding) and bounce back to normal. Both questions were formulated around this notion of struggle and coping, which was informed by existing research highlighting that respondents may feel more comfortable discussing vulnerability in

terms of *weakness, problems* and *constraints* (Heijmans and Victoria, 2001). Although this somewhat leads respondents to think in these terms, the researcher was cautious to not constrain the multiple contexts in which these terms might be described (e.g. spatial, temporal and social). Openly phrasing these questions in the context of time sought to prompt thinking throughout the course of a flood event (response and recovery) and capture how constructions of these concepts might shift through time. Attention was given to how participants interpreted and responded to the interviewer's use of language and how they themselves used certain terms, such as risk and vulnerability. This was crucial for understanding underlying constructions. In analysing and reporting research findings, caution was required in simply accepting participants' use of terms as evidence for an underlying construction. Colloquialisms are even evident in academic writing and therefore the implicit meaning of these terms were examined through line-by-line coding to challenge participant's interpretative frames that might otherwise remain taken for granted (Charmaz, 2006). This approach thus emphasises the *relational* nature of words and concepts in the formation of meaning (Green and McFadden, 2007).

As discussed in Chapter 2, existing research has examined social constructions of risk and vulnerability, by employing focus groups rather than in-depth interviews (Thrush et al., 2005). Given the household unit of analysis in this research, there was a need to capture nuances of understanding and experiences, which might otherwise have become masked in the group consensus incited in a focus group setting (Neal and Walters, 2006). Moreover, the guarantee of anonymity allows participants to freely share personal information, as well as potentially contentious and critical opinions. For instance, several participants displayed strong views on a fractured sense of community which they attributed to the influx of ethnic minorities; such a conversation would have been difficult to facilitate in a focus group session.

Each interview was transcribed using a professional transcription service, instructed to transcribe word for word (though ignoring 'umms', 'ahs' and pauses in speech). One transcriber was used to ensure consistency and final transcripts were checked by listening to the original recording. Although some regard transcribing as a crucial part of the analytical process, it can create over-familiarity and fatigue not conducive for long-periods of in-depth analysis. Representation is a key concern and it is acknowledged that participants' accounts become distorted as soon as the process of transcription occurs, through the selection of what is or is not transcribed (such as non-linguistic data; Samra-Fredericks, 1998). In this study,

interviews were also repeatedly listened to, to give a sense of the whole and prompt analytical thinking. The transcripts were then analysed according to the philosophy and practical coding techniques proposed by constructivist grounded theory, which is presented in Section 4.5.3 (Charmaz, 2006).

4.5.2 VIGNETTES

Vignettes were administered following the interview to elicit general and personal views on vulnerability and facilitate insight into underlying constructions. A key merit for employing this method, is that it provides a concrete example and contextual reference, particularly useful for those without direct experience of flooding (Barter and Renold, 2000). Vignettes can be defined as; "*Systematically elaborated descriptions of concrete situations…Short descriptions of a person or a social situation which contain precise references to what are thought to be the most important factors in decision making"* (Alexander and Becker, 1978). Although vignettes can be presented in different forms, including photographs, drawings and videos; in this study they were presented in the textual form of two stories. Each story contained a mix of potentially vulnerable or resilient characteristics and situations for the respondent to appraise and were informed by flood research presented in Chapter 2 (Box 4.2 and 4.3).

The main purpose of these vignettes is to encourage participants to actively interact and engage with the story, rather than passively responding to a static set of questions (Hazel, 1995). Selected participants were asked to evaluate and reflect upon the behaviour and decision making of the characters (i.e. in the third person), and also asked to consider how they themselves might react and feel in the situation. The value of adopting this third person perspective is that it provides a degree of distance between the participant and the researcher; thereby enabling them to discuss a potentially sensitive topic more freely (Barter and Renold, 2000). Whereas vignettes provide a point of reference for flood inexperienced participants, they also prompted those that had experienced flooding in the past to share further details and emotions, and recall memories not discussed during the initial interview.

The design of the story was informed through recommendations made by other authors employing the vignette method. Hughes and Huby (2001) assert that the story depicted in the vignette must reflect a believable reality and equally a situation and character that the respondent can relate to. Simultaneously there is a need to strike a balance between the

context and ambiguity presented; for example, Finch (1987) remarks "*although vignettes need to contain sufficient context for respondents to have an understanding about the situation being depicted, it is beneficial for them to be vague enough to 'force' participants to provide additional factors which influence their judgement decisions"*.

Another crucial decision concerns the number of vignette variations that are used. While survey research has employed as many as 50 vignettes, others have argued that more than three versions can cause confusion amongst research participants (Hughes and Huby, 2001). Ultimately, it is a matter of the research purpose and the level of detail one hopes to introduce within the vignettes. In this study, only two variations were presented. These were influenced by the 3-part vignette designed by Finch (1987), which follows the characters of the story through time. In this study, this design was used to incorporate the three main phases of the flood cycle; from warning and preparation, response and recovery. To some extent, this addresses the critique that vignettes often represent a static view on reality and acknowledges the dynamism in decision making (Hughes, 1998). Furthermore, it is possible that participants' constructions of vulnerability may vary between these different temporal scales.

It was apparent from the initial in-depth discussion at the start of the meeting that the interview was interested in the concepts of vulnerability, so a 'distraction vignette' was not administered. Moreover, it is not the intention in this instance to make statistical inferences between key factors within the vignette and respondents' attitudes. Either one or both vignettes were presented to respondents, although the order of presentation was varied to minimise the potential bias that this might cause. The 'stories' were very similar (although not completely identical to avoid reader fatigue) and the main variables adjusted.

BOX 4.2: VIGNETTE 1 "STEVE AND MANDY"

CONTEXT

Steve and Mandy Jones live with their two children, Alex (aged 2) and Charlotte (aged 6) in a residential area on the outskirts of the northern town of Oakton. They moved to the property 9 years ago when Steve was promoted to a manager at the local supermarket. Mandy is a full-time mum. Their 3 bedroom, semi-detached property has a view of the River More (aprox. 100 yards away). When they purchased the property they were told that it was built on the floodplain and had in fact been flooded once before, 13 years ago; but only minor damage was caused. And since then a levee has been built to heighten the river banks. Although they have never been flooded from the river, in times of heavy rainfall the water '*runs off the street like a river*' and one time the manhole burst at the bottom of the road – on this occasion the water flooded their drive-way and was inches from reaching the front door step, but it drained away very quickly.

PART 1

Mandy has planned a visit to her home town, a couple of hours drive away, where her parents and many of their friends still live; her and Steve are planning on driving up tomorrow with the kids. It has been a week of continuous rainfall and Mandy is discussing it on the phone to her mum. Steve is working until 10pm tonight and Mandy is watching the children by herself. Mandy receives an automated text message from the Environment Agency warning that the area is on Flood Alert.

PART 2

Mandy decided to wait and see what happened. The children are now in bed when Mandy notices how suddenly loud the rain has become. She looks out the window and sees that not only is water streaming down the road as it usually does, but it was flowing on the pavement and onto the driveway. Steve calls Mandy to explain that he is being re-directed home because the main road has been closed to traffic because of flooding; he plans to park his car and walk home. At this point in time the water is 16cm deep and seems to be level with the front door step.

PART 3

It is 4 months later and Steve and Mandy have just moved back into their property. It was flooded in November. They had decided to stay and had made minor preparations to protect their belongings (like moving the T.V.), but the carpet needed to be replaced, along with their sofas and arm chair, the cost of which was covered by insurance. Although the river level had risen, it turns out that the manhole at the bottom of their road had burst again and was responsible for the flooding. Mandy and the children stayed at her parent's home whilst the house was dried-out and redecorated, and Steve has been spending the week in a local B&B so he can still work.

BOX 4.3: VIGNETTE 2 "COLIN AND CAROL"

CONTEXT
Colin and Carol Baldwin live with their daughter Claire (aged 13) in a residential area on the outskirts of the northern town of Oakton. Colin's mum Evelyn (aged 79) lives by herself in a bungalow a few streets away. They moved to the property 9 years ago to be closer to Colin's mum. Colin has been working as an engineer for Northern Gas but was recently made redundant and Carol walks to her work at a nearby nursing home. Their 3 bedroom, terrace property is two streets away from the River More. When they purchased the property they were told that it was built on the floodplain; the neighbours have told them that some of the properties have been flooded in the past but as far as they are aware their property has never been flooded. In times of heavy rainfall the water '*streams down the road*', but it drains away very quickly and has never caused any problems to their home.

PART 1
It is a Sunday afternoon and Colin's mum has come round for a family roast dinner. It has been raining heavily and continuously for the whole week and a pool of water is collecting in the back yard. A next door neighbour knocks on their door to tell them that they have received an automated phone message from the Environment Agency to say that the area has been issued a flood warning.

PART 2
Colin suggested that his mum spend the night with them and she agreed. Colin went round to his mother's house to collect some of her things and brought them back to his home. They continue their afternoon with a game of cards, whilst it continued to rain outside.

PART 3
It is 4 months later. The River More did not flood in the end. Although there was some flooding in the area from a burst manhole cover as a result of the heavy rainfall, neither Evelyn's nor Colin and Carol's properties flooded.

Vignettes were administered with a degree of flexibility and not administered to every participant. This decision was based on the content and flow of the interview, as well as time constraints that the interviewee may have expressed at the start. Whereas in the Bradford case study, 13 participants commented on these vignettes (i.e. almost 50% of the sample), in the IOW case study only 3 participants were asked to engage with these vignettes. This was largely due to the reasons previously mentioned, but also several participants had experienced flooding at other locations and drew from these experiences, and even inexperienced households had a lot to say on the issue; therefore, it was felt that presenting vignettes would elicit little further information. Follow-up questionnaires were sent to participants and requested feedback on this method (Table 4.2). In both case studies the majority of participants felt that the vignettes helped contextualise flooding and helped them to imagine themselves 'in the shoes' of the characters. Moreover, the method was positively rated for breaking-up the interview process and making it more interesting.

Table 4.2: Participant feedback on vignette elicitation method, obtained from *follow-up questionnaire*

Feedback on vignettes	**Level of agreement** (4 point Likert Scale)	**Bradford case study** (n=13)	**Isle of Wight case study** (n=3)
The stories helped me to consider the issues that other households may face when confronted with flooding.	Agree and strongly agree Disagree and strongly disagree	92 8	100
I felt I could relate to the characters in the story.	Agree and strongly agree Disagree and strongly disagree	77 23	100
The stories helped me to imagine myself in 'their shoes' and how I would behave in that situation.	Agree and strongly agree Disagree and strongly disagree	85 8 (n=12)	100
I could identify the details which may have made the characters vulnerable (either before, during and after the flood event).	Agree and strongly agree Disagree and strongly disagree	100	100
I could identify the details which may have helped the characters to cope with a flood event (either before, during and after the flood).	Agree and strongly agree Disagree and strongly disagree	92 8	100
The discussion, questionnaire and the stories helped to break-up the interview process.	Agree and strongly agree Disagree and strongly disagree	92 8	100
The discussion, questionnaire and the stories made the interview process more interesting.	Agree and strongly agree Disagree and strongly disagree	92 8	100

There are a number of limitations to this method, which were also considered. Firstly, the vignettes could be accused of leading participants to think about vulnerability in a certain way, i.e. in terms of the socio-demographic differences between the characters. To some extent this was this intention, insofar as the research sought to examine how certain characteristics are included or excluded and weighted within constructions of vulnerability. However, vignettes were intentionally presented *after* the in-depth interview, to ensure that they did not influence or constrain responses.

It must also be acknowledged that the contextualised nature of vignettes is problematic in terms of generalising findings beyond the vignette setting. To some extent, this is overcome in this study by asking participants to consider their personal circumstances within the flood context of the vignettes; thus extending the scope of discussions. However, there is a contentious debate regarding the extent to which disclosed answers to a hypothetical

situation truly reflect people's decision making in reality (Rahman, 1996; Hughes, 1998; Barter and Renold, 2000). Nonetheless, there is strong support for the use of vignettes as a method for orientating the respondent and disentangling the complexities of real-life. In addition, the design of vignettes offers a degree of control and uniformity over respondents' perspectives to ensure that all responses are based on the same stimulus and therefore comparable (Hughes and Huby, 2001).

In this research, vignette-elicited discussions were transcribed with the in-depth interview, both of which were analysed individually and collectively. This analysis was conducted using the philosophy and practical strategies outlined through constructivist grounded theory.

4.5.3 CONSTRUCTIVIST GROUNDED THEORY FOR INTERVIEW ANALYSIS

It was the goal of this research to develop interpretive frames for understanding residents' constructions of vulnerability and the influence of 'insiderness' upon self-declared vulnerability. Therefore, data elicited from interviews and vignette methods administered with residents in the selected case studies, were analysed using grounded theory (as outlined by Charmaz, 2006). This method was originally proposed by Glaser and Strauss (1967) and is based on the premise that theory should emerge from the data through systematic, comparative analysis. Proponents of this method are essentially divided between two schools, for *objective* and *constructivist* grounded theory (Charmaz, 2006).

The original and revised versions of grounded theory (Glaser and Strauss, 1967; Glaser, 1978; 2001; and Strauss and Corbin, 1990; 1998) are essentially rooted in positivist thinking. Despite Strauss and Corbin's acknowledgement of the researcher's subjectivities, the guidelines they propose remain in the pursuit of objectivity and the neutral, value-free researcher (Charmaz, 2006). Post-modernists have critiqued the assumption of a single, external reality to be 'discovered' and the application of methods fragmenting the respondent's story and giving the researcher an authoritative voice (Charmaz, ibid). This has led some authors to apply a constructivist epistemology to grounded theory, acknowledging issues of positionality and recognising that the resulting analysis is in itself a construction of reality (Charmaz, 2006: 2005). In practise this requires the researcher to locate the process of grounding theory and the resulting findings and interpretations, within time, space and social conditions (Charmaz,

2006). This research ascribes to this latter constructivist philosophy for conducting grounded theory. This is based on the assumption that data or theory are not simply discovered, but rather constructed; *"…we are part of the world we study and the data we collect. We construct our grounded theories through our past and present involvements and interactions with people, perspectives and research practices"* (Charmaz, 2006: 10). This analytical process is illustrated in Figure 4.5.

In practice, grounded theory requires the researcher to be open to multiple meanings and interpretations, and necessitates a contextual understanding of the data. This requires a process of reflexivity in the actions and decision making of the researcher (Clarke 2005). Constructivist grounded theory necessities acknowledgement of preconceptions and the visible (and invisible) standpoints of the researcher. In this thesis, reflexivity was a continual part of the research process and is evidenced throughout this thesis in the justification of methodological decisions, data analysis and the interpretation of research findings in light of the alternatives. Memos and annotations were an invaluable tool supporting this process and tracking the evolution of categories and also helped inform the coding and organisation of data into emergent themes. In this context, memos are a crucial part of shaping analytic directions, examining connections in the data and increasing the level of abstraction required for theoretical explanation (Charmaz, 2006).

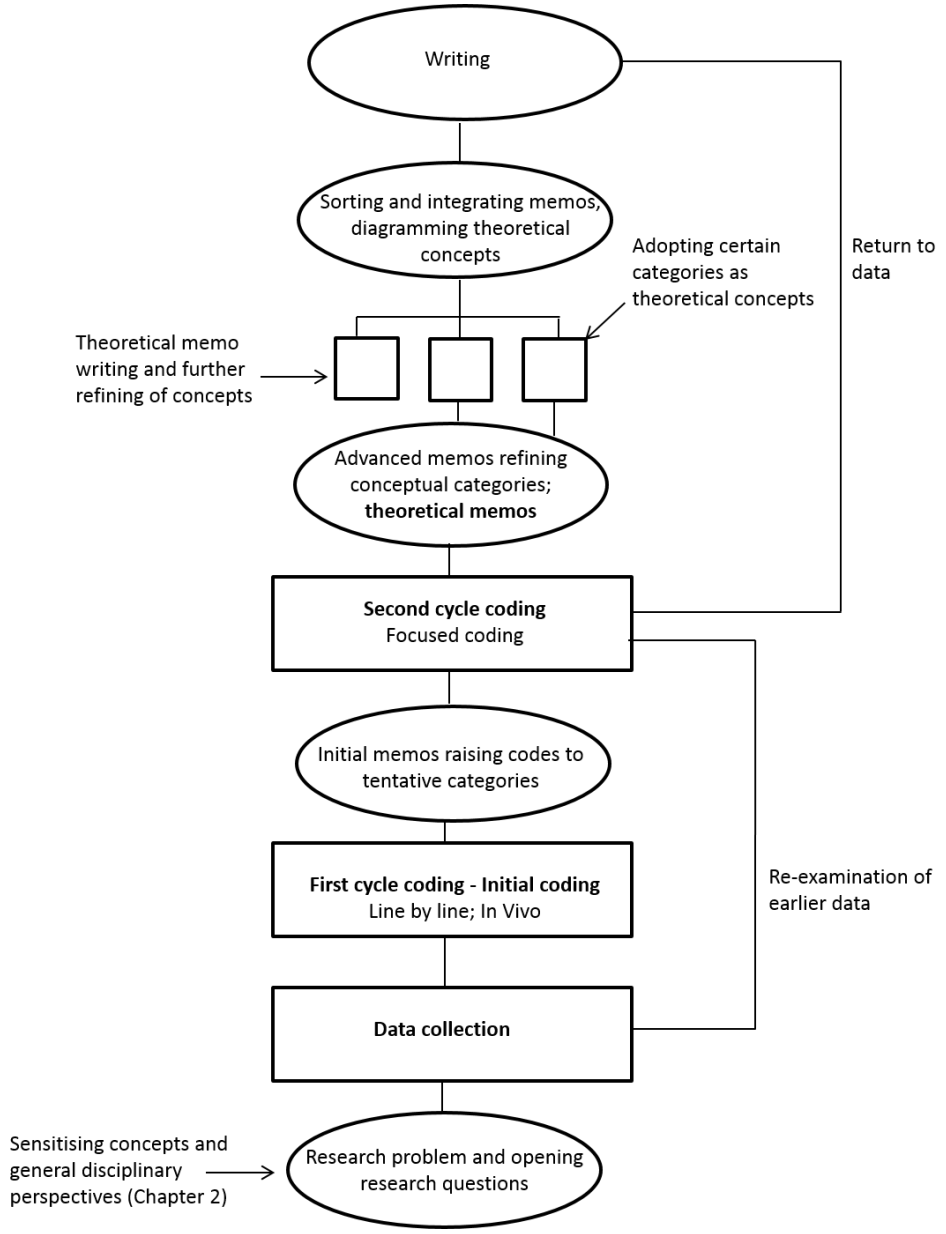


Figure 4.5: The analytical process for conducting grounded theory in this research (adapted from Charmaz, 2006: 11). Note: Theoretical sampling for further data collection was not conducted in this research and is therefore omitted from this diagram.

Coding is the main tool for qualitative data analysis and involves the organisation of data into coherent themes; "*coding distils data, sorts them, and gives us a handle for making comparisons with other segments of data"* (Charmaz, 2006: 3). While some authors contend that coding constitutes analysis (Saldana, 2009), coding is conceptualised in this research as an analytic tool, and a means of routing analytic thinking, sparking creativity and 'playing' with emergent ideas (Charmaz, 2006). The 'coding language' can be somewhat confusing to non-practitioners and key terms are summarised in Table 4.3.

Table 4.3: Defining language employed by grounded theory practitioners (based on Charmaz, 2006; with contributions from Saldana, 2009)

Term	Definition
Code	A word or short phrase that symbolically assigns a summative, salient, essence-capturing and/or evocative attribute for a portion of data (Saldana, 2009).
Initial coding	The first stage of exploring and understanding the data. Coding practices include word-by-word, line-by-line coding, incident coding and In Vivo coding.
In Vivo coding	Codes defined by the specialised terms adopted by participants; thus helping to preserve participants meaning and actions in the coding itself.
Line by line coding	The process of labelling and coding each line of written data. This process prompts the researcher to remain open and observe nuances in data.
Focused coding	Process of synthesising and explaining larger segments of data. Focused coding requires decisions about which initial codes make the most analytic sense in order to categorise data incisively and completely.
Theoretical coding	Examines the relationship between categories to construct theory and support theorising (i.e. practice of constructing an abstract understanding of the social world).
Category	A category subsumes common themes and patterns in several codes into an analytic concept, which explains an idea, event or process evident in data. The researcher then tries to define the properties of the category, the conditions under which it is operative, the conditions under which it changes, and its relation to other categories.
Theoretical concepts	Theoretical concepts constitute interpretive frames and offer an abstract understanding of relationships. Theoretical concepts subsume categories.
Theme	An outcome of coding, categorisation and analytic reflection

First-cycle coding (i.e. initial coding) is essential for enabling all possible categories and themes to emerge until a point of saturation is achieved. Initial coding ensures that codes are rooted in data and open to nuances in explicit and implicit concerns, actions and meanings of the participant. Charmaz asserts the impossibility of knowing what is in people's minds, for even explicit statements constitute *enacted accounts reflecting social context, time, place, biography and audience* (2006: 60). However, implicit meanings and actions can be acquired through the systematic comparison advocated by grounded theory. In this research, line by line initial coding was conducted to ensure that subsequent coding was firmly rooted in the data. Moreover, this method also encourages the researcher to challenge participants' interpretative frames that might otherwise remain taken for granted. In Vivo codes were also enacted where possible to preserve participants' meanings and actions within the coding itself.

Second-cycle coding involves a strategy of comparison, reorganisation, appraisal of properties and dimensions, focus and synthesis of categories (Saldana, 2009). This included focused coding, which similarly to Strauss and Corbin's (1990) strategy of axial coding, reassembles data to relate categories to sub-categories and identifies the properties and dimensions of these. Charmaz argues that unlike axial coding, which channels the researcher's thinking according to a set analytical framework (e.g. when, where, who, why etc), focused coding represents how the researcher has made *sense of the data* and facilitates theorising. The ultimate goal for conducting grounded theory is to construct theory; however Charmaz observes how grounded theory is often employed as a suite of techniques for *describing* rather than *analysing* qualitative data. Moreover, "theory" is a somewhat contested term. Whereas positivist theory aims to explain and predict, interpretive theory seeks to conceptualise social phenomena and provide *interpretive frames* from which to view realities (Alasuutari, 1996: Charmaz, 2006: 128). This research was orientated towards the latter. Theoretical codes emergent from the data, were used to "*weave the story back together*" and were identified and tested against the *existing* data (Glaser, 1978: 72).

Despite the application of grounded theory, theoretical sampling was not conducted in this research[29]. Grounded theorists advocate simultaneous data collection and analysis and the use of theoretical sampling to refine emergent categories and theory (Charmaz, 2006). In this research, 40 interviews were conducted in total with members of the public using a cross-sectional research design. This limits the extent to which theory can be developed from this study alone, thus emergent themes were highlighted for further exploration in future research.

Concurrently with coding, clustering was used as a visualisation technique to explore and refine relationships within and between emergent categories (see Charmaz, 2006: 86). Coding may be criticised for divorcing ideas from the stories, people and contexts in which they were divulged (McCormac, 2004). Whilst developments in computer software for analysing qualitative data facilitate fragmentation, they also enable the user to view excerpts within the interview as a whole and thus maintain the context required for understanding. In this research, the computer software "NVivo" was used to store and support the analysis of qualitative information. NVivo enables the user to annotate and create memos, supports open

[29] Theoretical sampling is a type of grounded theory sampling where the researcher seeks people, events or information to illuminate and define the boundaries and relevance of developing categories or theory (Charmaz, 2006: p189).

coding and the organisation of data. While some have argued that such computer-aided analyses distance the researcher from their data (Gibbs, 2002), it is argued here that this software in fact facilitates exploration into the connectivity of the data; across research participants and places, within and between themes. This was accompanied with traditional pen-and-paper techniques to facilitate analysis and visualise the data (i.e. "clustering"). Tables were also used to list key themes alongside significant examples (i.e. quotes) from each participant, to enable comparisons across themes for a single participant (horizontal axis) and within single themes for multiple participants (vertical axis).

Comparative analysis was also facilitated by comparing responses from participants with different degrees of flood experience and awareness of flooding. Existing research has highlighted the critical role played by flood experience in shaping household constructions of risk (Grothman and Reusswig, 2006: Burningham et al., 2008; Parker et al., 2009; Rose et al., 2012). Therefore, this analysis examines the nuances expressed between the groups presented in Figure 4.6. This typology of flood experience assigns an identity to the individual to indicate their level of interaction with flooding; where interaction is defined by physical (or sensory) interaction with flood water, and by social interaction. The model acknowledges that in locations of successive flooding individuals may accumulate multiple flood identities, or these may be accrued through experiences encountered in other locations. Flood awareness is intrinsically connected with experience, thus comparative analysis also took this into account. This was later applied to facilitate comparisons and insights into residents' different degrees of "insiderness" (developed further in Chapter 6). Furthermore, during the analysis and written description and interpretation of these findings, a distinction is made between those objectively and not objectively identified as exposed to flooding (based on the scientific flood modelling conducted for these locations). These conscious decisions strive to address Young's (2005) assertion that researchers need to be more critically and analytically aware of the multiple identities of participants.

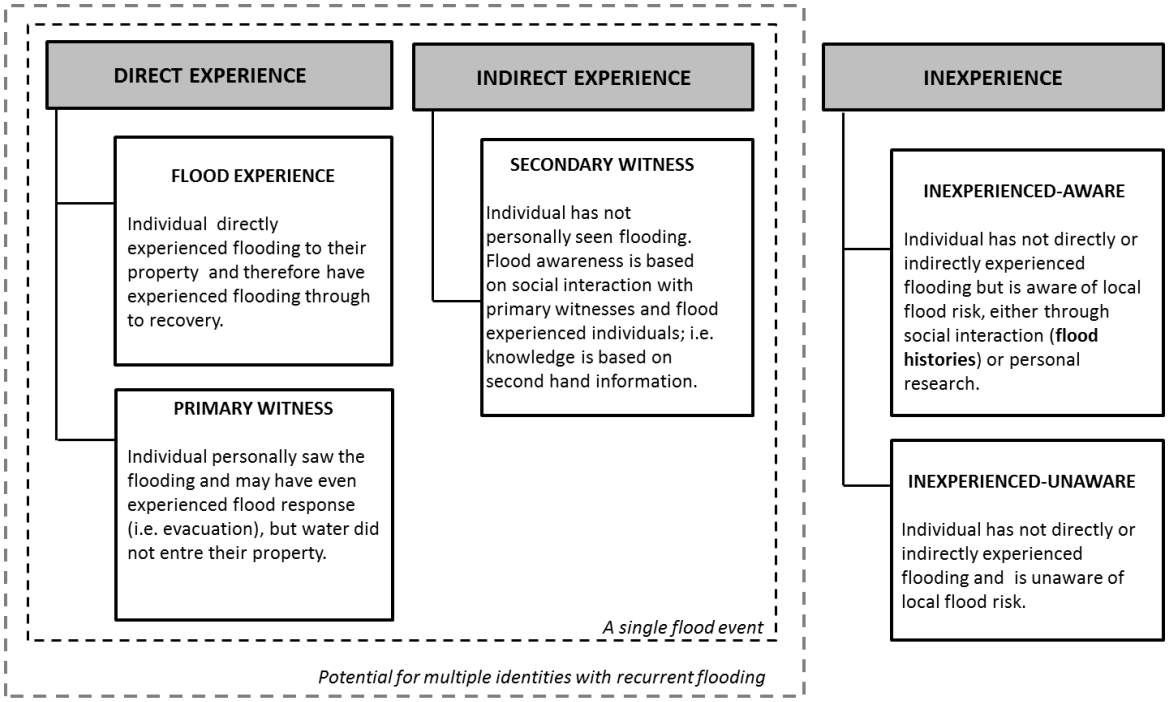


Figure 4.6: Typology of flood experiences, supporting comparative analysis to examine nuances in residents' constructions of vulnerability

4.5.4 QUESTIONNAIRES

While in-depth elicitation techniques are required to unveil the lived experience of being vulnerable and reveal the multi-layered nature of vulnerability, this was complemented in this research with questionnaires. This method was selected to elicit views on flood hazard, risk, vulnerability and resilience, and support quantitative analysis to examine patterns in the data. All data was entered and analysed in the statistical software package for social science, SPSS. Both inductive and deductive reasoning was used to identify significant differences and correlations through non-parametric statistical tests. Three questionnaires were administered in total and are reviewed in turn here. Each questionnaire is presented in Appendix A and the results discussed in Chapter 5.

4.5.4.1 FLOOD RISK AWARENESS QUESTIONNAIRE

The flood risk awareness questionnaire aimed to provide preliminary quantitative insight into household views of hazard and vulnerability and the underlying predictors of these. This method was selected due to its typically high response rates and for the control it provides the

researcher in motivating response, clarifying questions and probing answers (Bird, 2009; May, 2001). The objectives of this questionnaire were to;

- Identify future participants for more detailed questionnaire and in-depth interview
- To gauge people's first responses to an open question on declared vulnerability
- To elicit views on flood hazard and statistically significant variables related to this

This questionnaire was piloted in similar communities to the case study locations and revisions were made on the basis of participant and investigator feedback. The questionnaire was administered as a face-to-face questionnaire in both study sites and a door-to-door approach was taken to contact each household within the specified sampling frame. In the Bradford case study, community wardens from the Town Council assisted in this process and as known-faces in the community it was thought that they would facilitate trust. Furthermore, one warden was able to translate the goals of the research to non-English speaking residents, to ensure that sampling did not discriminate against this group. Where more than one researcher is involved, consistency across the research team is a critical concern, therefore prior to fieldwork, the community wardens were tutored on how to administer the questionnaire. Self-administered questionnaires were also used to minimise the potential bias in respondents (i.e. residents at home during the day). While this method provides greater anonymity and thinking-time, it cannot deliver the opportunities of a personally-administered questionnaire and is thus marked by considerably lower response rates (Table 4.4).

Table 4.4: Number of responses obtained for the *flood risk awareness questionnaire*

Questionnaire type	Bradford town, West Yorkshire	Isle of Wight town
Face-to-face questionnaire	71	19
Self-completed questionnaire	12	12
Total	**83**	**31**

The questionnaire was designed with a mix of closed and open questions. There is some debate in the literature regarding the order of questionnaire items and the appropriateness of prioritising socio-demographic questions which can be highly personal (e.g. income) and raise the question of relevance. However, there is an argument for administering these types of questions first; as they are commonplace and can serve as a means of familiarising the

participant with the routine of completing a questionnaire (May, 2001). Respondents were informed at the beginning that these details were required in order to understand the 'make-up' of the household (and community overall) and how this may relate to their understandings of flooding. It was emphasised that participants could refuse to answer certain questions, without having to give a reason, and that all responses would be anonymous and confidential.

Likert scales (see May, 2001), were used to assess participants' views on the *likelihood of flooding* both to their property and to the local area (i.e. town). The term "risk" was not used at this stage. As demonstrated in the reviewed literature in Chapter 2, "risk" can be interpreted in different ways, thus "flooding" was deemed as a more neutral term. Distinctions were not made between the types of flooding, but focused generically on the possibility of flooding only. Additional Likert scales were used to examine the influence of flood experience upon participants' engagement with flooding (i.e. self-monitoring, property protection measures) and attitudes towards household responsibility; these questionnaire items were referred to as "*flood impact scales"*.

Several open-questions were used to gauge awareness of flood history, defences and views on the local causes of flooding. Vulnerability was also assessed in this way; "*As a household, can you think of anything that might make you vulnerable if a flood was to occur? By 'vulnerable' we mean what might make it difficult for you to respond, cope or recover from a flood event"* (Q25, Appendix A1). The strengths and limitations of this approach are summarised in Table 4.5. The main purpose of using an open-ended question was to shed light on the type of first-hand responses to the term 'vulnerability' and elicit the participant's understanding of this term rather than imposing an 'outsiders' perspective. Moreover, the phrase "*respond, cope and recover*" sought to avoid constraining answers in a specific point in time. The qualitative responses were analysed in NVivo. Although researchers were instructed to record the word-for-word responses of the participants' as best as possible, it is recognised that this is not always possible and to some extent, the answer recorded is based on the subjectivity of the researcher. This does not necessarily facilitate In Vivo coding from the participants own words; however, this analysis was not used to draw conclusions about the nature of declared vulnerability but simply to highlight the range of themes that emerged and help inform the topics for in-depth interviews. In retrospect, this variable should have been additionally represented as a scale questionnaire item to facilitate quantitative assessment and accompany the scales used to assess household views of flood hazard; however, for quantitative analyses

the qualitative responses were transformed into a categorical variable for ***declared vulnerability***; based on the categories of yes or no. Chi Square tests were computed in SPSS to identify potential differences between declared vulnerability and key socio-demographic groups.

Table 4.5: Identifying the strengths and limitations of eliciting views on household vulnerability through an open-ended question (Q25) in *flood risk awareness questionnaire*

Household-declared vulnerability (Q25)	
Strengths	**Limitations**
▪ Elicit "insider's" understanding of the term 'vulnerability', without imposing an "outsider's" definition	▪ Questionnaire format limits the sharing of personal information on vulnerability; moreover, it is difficult for the research to record participant descriptions word-for-word
▪ Reveal nuanced understanding to help inform themes for in-depth interviews	▪ Reductionist and overly-simplistic coding of qualitative responses is required to facilitate quantitative analysis

Table 4.6 lists the key variables examined in this analysis and shows a mix of questionnaire-derived data and data derived from scientific flood modelling. External data sources included the outputs from fluvial and pluvial flood modelling; as well as metrics for social vulnerability, calculated by the SFVI (Tapsell et al., 2002) and the IMD (DCLG, 2008).

Table 4.6: Key variables obtained from the *flood risk awareness questionnaire* and external data sources

VARIABLE	DATA SOURCE: QUESTIONNAIRE	DATA TYPE
View on *property exposure* to flood hazard	**Q18**: In your opinion, on a scale of 1 to 5, with 1 being very unlikely and 5 being very likely, what is the likelihood of your home being flooded?	Interval (1 – 5)
View on *town exposure* to flood hazard	**Q26:** In your opinion, on a scale of 1 to 5, with 1 being very unlikely and 5 being very likely, what is the likelihood of flooding in the [input town name]?	Interval (1 – 5)
Declared vulnerability	**Q25:** *As a household,* can you think of anything that might make you *vulnerable* if a flood was to occur? *By 'vulnerable' we mean what might make it difficult for you to respond, cope or recover from a flood event.*	Nominal Examined as binary Yes / No
Socio-demographic characteristics	**Q3, Q5, Q9, Q10, Q15** Including: Elderly / Single parent / Limiting long-term illness or disability / Non-home ownership / Unemployment	Nominal (Yes / No)
Researcher-identified vulnerability category	In SPSS, each variable representing these SFVI indicators (listed above), was coded according to whether the criterion was met (i.e. 1 for yes, 0 for no) and the scores simply combined in an additive model and categorised according to the number of criterion satisfied.	Ordinal
VARIABLE	**DATA SOURCE: EXTERNAL**	**DATA TYPE**
IMD	Index of Multiple Deprivation (2007) available from DCLG (2008). Original rank is re-scored to give a relative rank for the area (where 1 indicates higher deprivation).	Ordinal
SFVI	Social Flood Vulnerability Index from Tapsell et al. (2002)	Ordinal
Fluvial hazard (i.e. objective exposure to fluvial flooding)	Fluvial floodplain provided by UK Environment Agency; 25 year, 50 year and 100 year flood outline [Bradford only]	Nominal (Within / Outside flood boundary)
Pluvial hazard	Derived from 1D-2D inundation modelling. Multiple scenarios examined for 1 in 30 year / 50 year / 100 year events. Flood Map for Surface Water provided by UK Environment Agency	Nominal (Within / Outside flood boundary)

This research needed to distinguish clearly between participants exposed to flood hazard and those not, according to the scientific modelling available to this study. This is referred to throughout this thesis as the **'objective hazard exposure'**[30]. In order to assess participants' exposure to flooding, a series of challenges needed to be overcome. Firstly, a distinction was made between the types of flooding. This was particularly relevant to the Bradford study, as some participants were exposed to fluvial and/or pluvial flooding. Secondly, the decision was made to derive hazard boundaries from frequent, moderate and infrequent flooding to capture the spatial gradient of risk (Table 4.7).

Table 4.7: Different frequencies of flooding used to determine objective boundaries of flood hazard

Type of flood	Frequent	Moderate frequency	Infrequent
Pluvial (derived from FRMRC modelling)	1 in 30 year event (Bradford) 1 in 20 year event[31] (IOW)	1 in 50 year event	1 in 100 year event
Fluvial (derived from EA mapping: Bradford study only)	1 in 25 year event	1 in 50 year event	1 in 100 year event

Crucially, a method needed to be developed for determining whether the sampled property was potentially at-risk of flooding. The difficulty with using pluvial modelling is that the models are run with the buildings in-place, meaning that the simulated flood is often constrained to the areas outside the property boundaries (i.e. in the road). Moreover, local features may alter the conveyance of water and result in different pathways to that modelled; such as the presence of a wall, a dropped curb, steps up-to the front door or a basement. Such local features were taken into account in the flood risk awareness questionnaire and mapped on a property-by-property basis in GIS. To determine the property's exposure to flooding, a buffer

[30] The results from scientific flood modelling are referred to as 'objective' constructions of hazard exposure, in order to separate this scientific formulation from the subjective constructions of hazard and risk examined through resident and professional participants.

[31] The 1 in 30 year pluvial flood was not modelled for the IOW study, therefore the 1 in 20 year scenario was selected to maintain consistency with available data from the Environment Agency and Bradford case study.

was applied from the centre point of each property and was used to ascertain flood statistics[32] (Figure 4.7 & 4.8). Each property sampled, was coded as either at-risk or not at-risk of flooding, derived from the following criteria;

- **Maximum flood depth within buffer zone** – Assumption that property is level with the ground surface, unless otherwise specified. Depths below 0.0 meters are discounted (Figure 4.8)

- **Presence of local features which may heighten** (e.g. basement, downward slope to property, dropped-curb) **or lessen risk of flooding** (e.g. steps up-to front door, rising slope to property or external walls to front/back garden)

The distance of the buffer (in meters) was based on a number of considerations. Firstly, properties with known histories of flooding, were used to trial appropriate distances (Figure 4.7). Secondly, consideration was given to the type of property. Both locations were predominantly occupied by terraced and semi-detached properties, which vary in their parameters. Terrace properties sampled in the IOW study averaged 11.6m by 4.2m; compared to terrace properties in the Bradford study, which were 8.5m by 5.1m. Likewise, semi-detached properties averaged 14.1m by 5.4m in the IOW study, and 8.6m by 5.8m in the Bradford study[33]. A balance was sought between under-or-over representing the potential risk posed to each property, whilst trying to maintain consistency across study sites. As illustrated in Figure 4.7, a buffer distance of 5m or 8m was insufficient in capturing flood risk for a selection of terrace properties in the Isle of Wight study, all with a known history of pluvial flooding. A buffer distance of **15m** was selected to capture flooding within the street surrounding the property; if flooding intersected this boundary, then the mean depth and recorded-local features were consulted to confirm the property's risk category.

[32] Descriptive statistics for the minimum, maximum and mean depth were obtained in ArcMap; the maximum flood statistic was selected to fully capture the potential risk posed to the property. Statistics for the mean failed to record flood risk at properties with known histories of flooding.

[33] Parameters for different types of properties (semi-detached or terraced) are each based on an average of 20 properties; either sampled for the flood risk awareness questionnaire or the post-interview questionnaire.

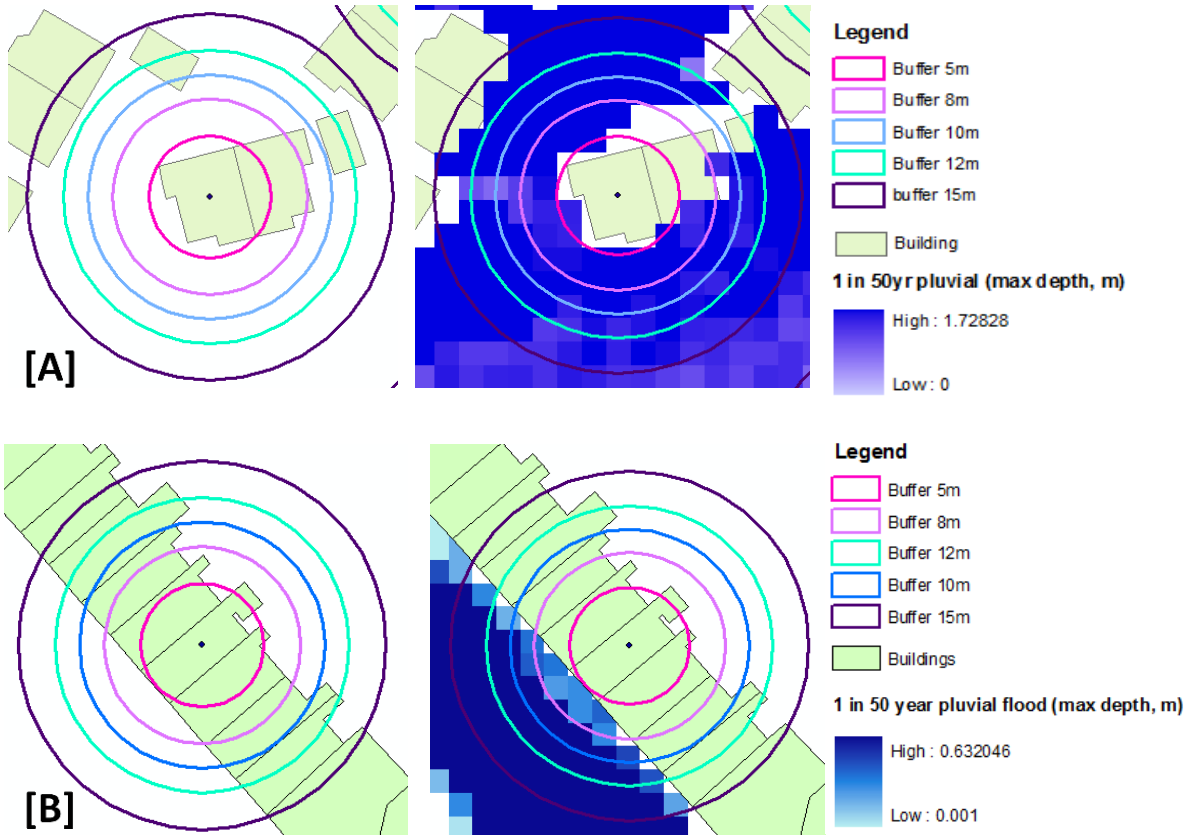


Figure 4.7: Trialling buffer distances for different types of property. Example (A) shows semi-detached property in the Bradford study; example (B) shows terraced property, with a known history of pluvial flooding, in the IOW study

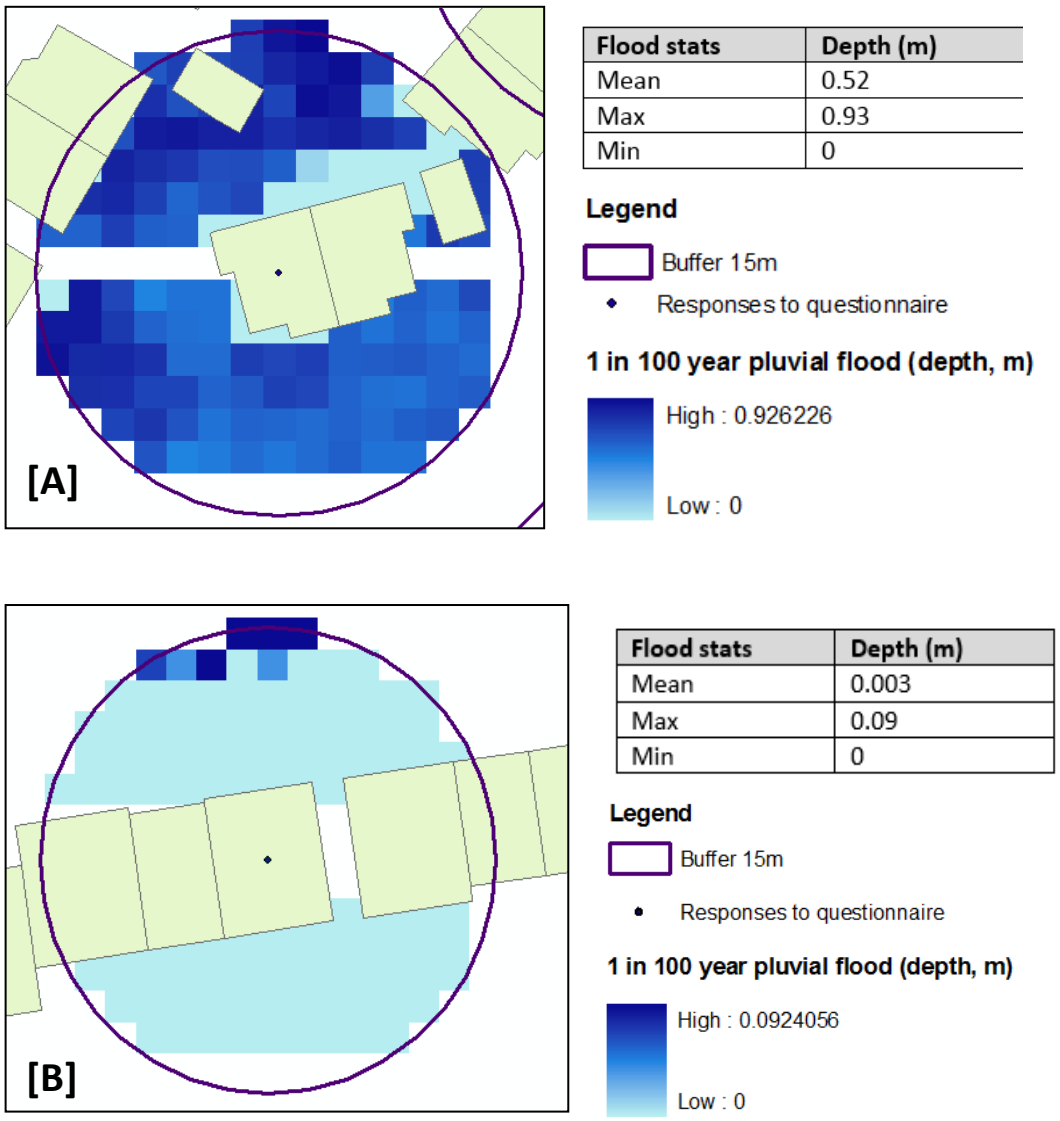


Figure 4.8: Risk to property determined from average flood depth recorded within 15m buffer; property A (top) is at-risk of flooding, whilst property B (bottom) is not at-risk of flooding.

Analysis was also conducted for the boundaries recorded in the EA mapping for fluvial flooding, relevant to the Bradford case study, only. The EA's surface water flood map was also used in the Bradford study as some participants were sampled outside the model boundaries used by Chen et al. (2010); to maintain consistency with Chen's model, the outline for the 1 in 30 year flood was used. Collectively, these boundaries for flood hazard were employed to examine the "fit" between objective and subjective views on flooding held by the residents sampled in this research.

4.5.4.2 POST-INTERVIEW QUESTIONNAIRE

The post-interview questionnaire was administered to participants immediately following the in-depth interview and prior to vignettes, essentially acting as a 'conclusion' to the meeting and aiming to summarise some of the key information that had emerged. The aim of these questionnaires was to facilitate both inductive and deductive analyses to address Research Question 1 and satisfy the following objectives;

- Obtain key socio-demographic variables
- Obtain metrics for views ('self-declarations') of risk, vulnerability and resilience:

Declared risk:	*'I do not consider myself to be at risk from flooding'*
Declared vulnerability:	'*I do not consider myself to be vulnerable to flooding'*
Declared resilience:	'*If my property were to flood, I would be able to cope'* (Coping self-efficacy)
	'If my property were to flood, I would soon bounce back to normal' (recovery self-efficacy)

- Explore the potential relationship between personality (optimism/pessimism) traits i.e. participant's general outlook of life, and household views
- Explore potential relationship between coping behaviours and household views
- Examine attitudes towards flooding and flood risk management

All variables were addressed in a closed way. Likert scales were used to quantify household declarations for vulnerability, risk and resilience, amongst others relating to personality and coping traits, and general attitudes towards flooding. This questionnaire was designed and revised on the basis of the flood risk awareness questionnaire; e.g. additional questions were introduced from responses to the open question on vulnerability. Again, "risk" was not distinguished between the different types of flooding in the area, though was examined during the in-depth interviews.

"Declared resilience" included two questions related to coping self-efficacy and recovery self-efficacy. The former, is defined as "*the self-belief of being able to cope successfully with a particular situation*" (Schwarzer and Renner, 2000). Recovery self-efficacy is defined by Schwarzer (1999) as an "*optimist belief in one's capability to overcome setbacks*". Both are considered to be important for resilience and the success of reactive and anticipatory coping (Schwarzer and Knoll, 2003). Further questions were included to capture participant's access (and reliance) upon social support networks and were adapted from the Oslo 3-item social support scale[34] (from Dalgard et al., 2006). This was informed by reviewed literature, documenting the importance of social support in the context of informal warnings and risk communication, as well as coping (Aspinwall and Taylor, 1997; Handmer, 2000; Haynes et al., 2008).

Dispositional characteristics were also included within this questionnaire on the basis of reviewed literature. This included attitudes towards fatalism ("*most of what happens in life is just meant to be*") and locus of control ("*there's nothing we can do to prevent flooding*"). Section 2.3.2.2 provided mixed evidence about the positive or negative affect of optimism-pessimism in 'perceptions' of risk, attentiveness towards risk information and willingness to adopt precautionary behaviour (Scheier et al., 1986; Aspinwall and Brunhart, 1996; Grothmann and Patt, 2005). Therefore, questions pertaining to an individual's outlook on life, whether optimistic or pessimistic, were included in this questionnaire (Table 4.8). A sample of statements concerning optimism and pessimism were adopted from the Optimism/Pessimism Instrument (OPI), which is based on 56 statements, each assessed on a 4-point Likert scale based on levels of agreement with each statement (from Dember et al., 1989). Respondents were asked to not spend a lot of time thinking about each item, but base their response on their first impression (as prescribed in the original method).

[34] This included Q19 and Q20. The third item of the Oslo 3-item social support scale was not included because it was deemed less relevant to a flood-orientated questionnaire ("How much concern do people show in what you're doing").

Table 4.8: Statements for assessing traits of optimism and pessimism, from the Optimism/Pessimism Instrument (OP1, Dember, 1989)

Statement from OPI suggesting pessimism	Statement from OPI suggesting Optimism
It is best not to set your hopes too high since you will probably be disappointed	I generally look at the brighter side of life
Rarely do I expect good things to happen	I generally make light of my problems
I have a tendency to blow up problems so they seem worse than they really are	Where there's a will there's a way
	Every cloud has a silver lining[35]

Also considered, was the potential influence of **proactive coping**. Whilst previous studies have focused on *reactive coping* in the aftermath of a hazard event (i.e. how the individual compensates loss or alleviates harm); research in positive psychology has drawn attention to the benefits of *positively motivated* coping (Aspinwall and Taylor, 1997; Greenglass and Fiksenbaum, 2009). Proactive coping is defined as *the process through which people anticipate or detect potential stressors and act in advance to prevent them or mute their impact (*Aspinwall and Taylor, 1997). Proactive coping is future-orientated, involving the accumulation of resources to identify and address potential source of stress in general, rather than a specific, extant threat. However, research suggests that the degree to which an individual or household has engaged with proactive coping will influence their resilience, the effectiveness of reactive coping, distress and the experience of a specific event (Schwarzer and Knoll, 2003; Greenglass and Fiksenbaum, 2009). In the hazard context, other authors have looked to every-day coping processes. For instance, McIvor and Paton (2007) examine how problem-solving and intentions to seek information can influence people's predispositions to act and their intentions to adopt protective measures. Arguably, proactive coping could be relevant for understanding how flood events are managed and experienced by those affected, as well as their attitudes towards household responsibility in FRM.

Questionnaire items relating to coping were adapted from the Proactive Coping Inventory (PCI), which addresses 7 subscales for proactive, reflective, strategic, preventative, instrumental support seeking, emotional support seeking, and avoidance coping (Greenglass et al. 1999). This standardised, 55 item-questionnaire is designed to assess skills in coping with

[35] This questionnaire item is also indicative of "benefit fitting", a coping strategy described by Davis et al., (1998) in the context of constructing meaning from stressful events (see review in Schwarzer and Knoll, 2003).

distress, skills which promote well-being and life satisfaction. While recognising that omitting items invalidates the psychometric qualities of the original questionnaire, only a sample of questions were used from each subscale to allude to this potential influence, rather than conclusively demonstrate it. Several questions were adopted from the Proactive Coping Inventory in order to assess different dimensions of coping, and are outlined in Table 4.9 (PCI, Greenglass et al., 1999).

Table 4.9: Sub-scales of the Proactive Coping Inventory (PCI) and questions selected for the *post-interview questionnaire* (adapted from Greenglass et al., 1999)

Sub-scale on PCI	Description	Questions selected for the post-interview questionnaire
Proactive coping	Measures proactive coping exclusively. Based on 14 item scale and combines autonomous goal setting with self-regulatory goal attainment cognitions and behaviour.	I am a take charge person I try to let things work out on their own (negative item)
Reflective coping	11 item scale, describes simulation and contemplation about a variety of possible behavioural alternatives by comparing their imagined effectiveness; includes brainstorming, analysing problems and resources, and generating hypothetical plans of action.	I imagine myself solving difficult problems I think about every possible outcome to a problem before tackling it
Strategic planning	4-item scale focuses on the process of generating a goal- oriented schedule of action in which extensive tasks are broken down into manageable components.	I often find ways to break down problems into manageable components I make a list and try to focus on the most important things first
Preventative coping	Deals with anticipation of potential stressors and the initiation of preparation before these stressors fully develop. E.g. purchase of insurance and accumulation of social networks.	I plan for future eventualities I prepare for adverse events
Instrumental support seeking	8 item scale, focuses on obtaining advice, information and feedback from people in one's social network when dealing with stressors.	Information I get from others has often helped me to deal with my problems I ask others what they would do in my situation
Emotional support seeking	5-item scale aimed at regulating temporary emotional distress by disclosing to others feelings, evoking empathy and seeking companionship from one's social network.	I know who can be counted on when the chips are down
Avoidance coping	3-item scale, eludes action in a demanding situation by delaying decision making/response.	When I have a problem I like to sleep on it

4.5.4.3 FOLLOW-UP QUESTIONNAIRE

Follow-up questionnaires were sent to each participant two weeks after the initial interview and completion of the post-interview questionnaire. The purpose of this was to capture potential changes in participant opinion that might result from self-reflection post-interview or have been influenced by other factors, such as interviewer bias, during the original interview itself. There was therefore a degree of repetition between these questionnaires. One might hypothesise there to be a statistically significant difference between certain questions in their before/after responses, such as household declared risk and householder's general concern towards flooding, which a flood-related interview is likely to have heightened. In order to test this, a related samples Wilcoxon signed rank test[36] was applied to the data to contrast the results. Significant differences were identified for the variables listed in Table 4.10. As hypothesised, awareness of flooding was somewhat heightened post-interview; however in the Bradford study, there was also a marked reduction in household declarations of coping. This observations highlight the potential bias created by the interview process and is further discussed in Chapter 9.

Table 4.10: Significant differences identified between interview and follow-up questionnaires from Wilcoxon signed rank test

Bradford case study (n=20)	Isle of Wight case study (n=12)
▪ If my property was flooded, I would be able to cope ▪ Flooding in the UK is likely to become more of a problem in the future ▪ Flooding is not a major concern for this household	▪ Flooding is not a major concern for this household

In addition, this questionnaire asked respondents to consider the use of social indicators in FRM; a topic that was introduced during the interview. An open question was also used to elicit respondent's views on what helps people to cope, so as to capture the respondent's overarching opinions following the interview process. These qualitative responses were analysed in NVivo and are discussed in subsequent chapters.

[36] The Wilcoxon signed-rank test is a non-parametric equivalent to the dependent T-Test, for comparing two sets of scores from related samples (Field, 2005)

4.6 EVALUATING THIS RESEARCH

The mixed methods design presents a particular challenge for evaluating this research. Firestone (1987) argues that there is a rhetorical connection between methods and paradigms, thus the method selected encourages the researcher "*to adopt the conventions of presentation*". This is certainly evident in this thesis and the reader will observe this rhetorical shift between sections of quantitative and qualitative analysis. Consequently, there are conflicting criteria for evaluation.

Questionnaires were analysed using quantitative methods and to some extent adopt conventional notions for establishing rigour, in terms of validity, reliability and generalizability (Baxter and Elyes, 1997; Field, 2005). This is discussed in the context of the flood risk awareness questionnaires, but is less important for post-interview and follow-up questionnaires given the differences in their underlying purpose (see Figure 4.2). However, the qualitative methods used in Phase 1 and 2 of this study are not compatible with these criteria. Instead, the influential framework proposed by Lincoln and Guba (1985) is adapted to consider the *credibility, transferability, dependability and confirmability* of this research. This is summarised in Figure 4.9. For example, triangulation through mixed-methods is used to enhance the credibility and dependability of this research as it forces the researcher to confront and account for points of convergence and disagreement in the data; therefore, avoiding data fitting (Fielding and Fielding, 2008).

Credibility requires authentic representation (Lincoln and Guba, 1985). Grounded theory proposes a number of strategies which root analysis in the data; such as the incorporation of participant voices within the coding framework (In Vivo codes) and the step-by-step justification of decision making through memo writing (Saldaña, 2009). The presentation of verbatim quotes is widely used in this thesis to present meanings and experiences as defined by the participants themselves. However, the representativeness of quotations can be challenged; *"While there need not be a model for the size and number of quotations, it is reasonable to expect some discussion of why particular voices are heard and others silenced through the selection of quotes"* (Baxter and Eyles, 1997). Moreover, there is an issue of weighting emergent themes and whether a theme evident in one participant only, is less significant than a theme evident in several. Ultimately, these decisions are steered by the goals and questions of this research. It is not possible to represent every emergent theme or the

voice of every research participant, or situate voices within the wider context. Furthermore, it is arguably inadvisable to seek to do so and risks the conceptual clarity of the research. Although the use of examples, and the tendency towards explicit examples, could give the impression of partial representation (Harries, 2008); the findings presented in this thesis are grounded in analysis of the whole interview and the analysis of the whole sample. Moreover, quotes are utilised to demonstrate the connectivity between data and concepts (Eyles, 1988).

The notion of transferability is contested amongst qualitative researchers. The goal of this research is to reveal in-depth constructions of vulnerability and consider the contextual influences shaping these constructions. At this stage, this research does not aim to extend this discussion to other places, but transparency in the research process (e.g. memos, code book) will enable emergent themes to be explored elsewhere in the future and steer theoretical sampling to test and refine theory in other contexts.

Finally, Lincoln and Guba speak of the *confirmability* of the research as akin to the threats to objectivity in positivist study. It is important to acknowledge the positionality of the researcher as an active participant in the research process; indeed, both researcher and the researched collectively shape the interview process (Charmaz, 2006). Rather than confirmability, this researcher prefers to phrase this in terms of *transparency* in the research process to demonstrate integrity and trustworthiness (Baxter and Eyles, 1997).

Reflexivity is a crucial process for ensuring credibility and transparency in the research. Reflexivity can be defined as "*the researcher's scrutiny of his or her research experience, decisions, and interpretations in ways that bring the researcher into the process and allow the reader to assess how and to what extent the researcher's interests, positions and assumptions influenced inquiry*" (Charmaz, 2006: 188). Reflexivity essentially makes the researcher 'visible' (England, 1994); or may be alternatively described as "outing" the researcher (Finlay, 2002). Numerous strategies in reflexive writing have developed to deconstruct the authority of the researcher and the challenge of representation, such as the use of stories and plays (see review by Pillow, 2003). The positionality of the researcher is critically evaluated as part of the reflexive research process. Often, qualitative researchers provide written personal and professional biographies to inform the reader of their relationship to the topic and those under study (Butler, 2001). Uniquely, Ryan and Golden (2006) present this in the context of a quantitative study, emphasising the importance of not conceiving reflexivity as threatening to

the validity of research. Although researcher biographies are widely used, this approach is criticised for assuming a knowable self and as being self-indulgent, and even narcissistic (Patai, 1994). Others have accused researchers of seeking "*a comfortable, transcendent end-point*" (Pillow, 2003). Ryan et al. (2011) reflect on the insider-outsider status of the researcher and argue that in reality it can be very difficult to know how participants will place the researcher. Furthermore, there can be benefits and drawbacks to both identities. Whilst peer researchers for instance, may help to target hard-to-reach groups, the assumption of shared knowledge can mean that researchers are less likely to probe given responses. Equally, participants may feel more comfortable and willing to share their experiences with "outsider" researchers.

Whilst this study examines the "insiderness" of participants, there is a need in the outset to acknowledge that the researcher also negotiates different identities across the insider-outsider gradient in order to facilitate the interview process. For instance, this researcher was born on the Isle of Wight and needed to stress their insiderness to encourage participation. Whilst the "southern-ness" of the researcher may have created a barrier in the Bradford study, the "northerner-southerner" distinction served as a source of humour and ice-breaker in some interviews. Moreover, the "outsiderness" of the researcher and perceived neutrality of the research occupation, seemed to help participants to freely discuss their local concerns. Similarly, the outsiderness and insiderness of the researcher (i.e. as a policeman's daughter), were identities drawn upon during interviews with emergency professionals. However, whilst reflexivity has been a conscious part of the research process, with every methodological and interpretive decision justified in relation to alternatives and articulated throughout this thesis; a deeper discussion of positionality is intentionally absent. This decision is justified on the basis that positionality is already documented in a vast body of existing research (e.g. Butler, 2001; Ryan et al., 2011), whereas in comparison, critical reflections on the "positionality" of the participants themselves is somewhat lacking (Young, 2005).

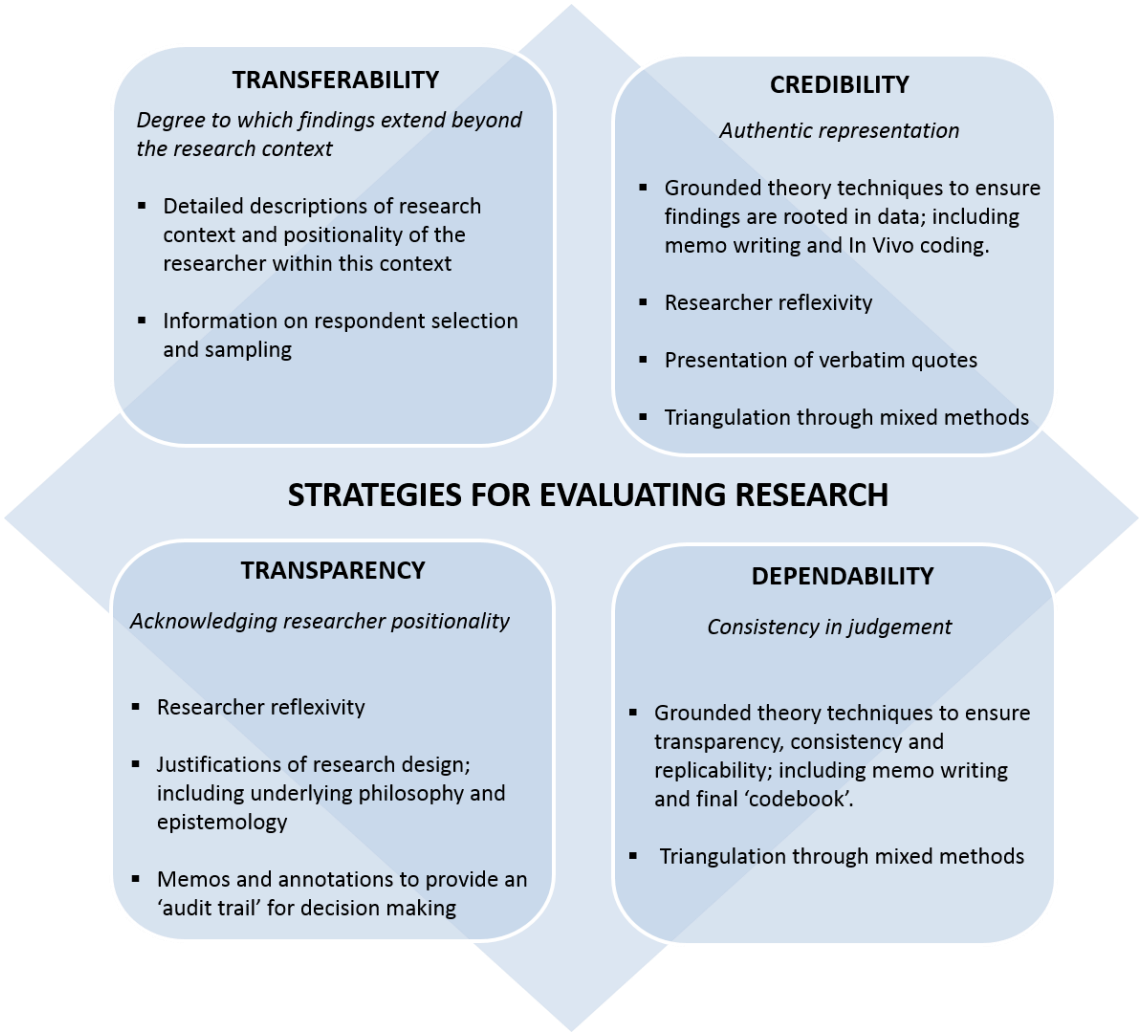


Figure 4.9: Strategies for evaluating this research (informed by Lincoln and Guba, 1985; Baxter and Eyles, 1997; Charmaz, 2006)

4.7 LIMITATIONS OF THE RESEARCH

This brief section acknowledges some of the broader limitations of the research design. This research provides insight into the constructions of vulnerability from multiple perspectives, both within a professional community of emergency professionals and within (and between) two communities at risk of flooding. Theoretical sensitivity was achieved through academic and grey literature reviews and immersion in the primary data collected. Fieldwork was conducted over the course of three weekly visits in Bradford, and day visits over the course of a month on the Isle of Wight. Immersion in the field and studied phenomenon is regarded as essential in ethnographic research which draws from observations, as well as discussions, with

participants (May, 2001). However, it is the opinion here, that immersion can be achieved through in-depth data analysis.

The research is underscored by a constructivist epistemology and uses a small sample size to examine vulnerability and other allied concepts *in context*, and therefore does not claim to be representative of the population exposed to flooding as a whole. The theoretical discussion presented in this thesis is rooted in the data and context in which it was obtained. This study represents a cross-sectional piece of research and therefore accounts are positioned in a specific time and place. Cross-sectional designs have been criticised for delivering a 'snap-shot' and static representation of the studied phenomenon. However, the research is not static in its analysis and critically examined participant reflections through time (e.g. before and after flood experiences); in the Bradford town for instance, interviews were conducted around the 12th anniversary of the 2000 flood event, which enabled this research to examine the extended impacts of flooding in the community.

Both study sites occupy complex hazard settings and locations that have undergone major flood mitigation work to protect against fluvial flooding in Bradford, and pluvial flooding in the IOW. These settings enabled critical examination of vulnerability constructions in the context of multiple flood threats and in defended place. The relevance of findings to other contexts (e.g. non-defended place), and other cultural contexts warrants further attention. Moreover, this research acknowledges that findings are not only shaped by the researcher and participant, but also reflect the methods used to facilitate interaction. Other elicitation techniques may reveal different aspects.

4.8 ETHICAL CONCERNS

This research adheres to the guidelines of the University and the Social Research Association (SRA, 2003) and the stipulations of the Data Protection Act (DPA: HM Government, 1998). Section 33 of this act enables research to be conducted at the household scale providing that;

I. The data is processed in a neutral way (i.e. not informing decisions regarding the data subject)
II. The data subject is protected against harm or distress
III. The results presented do not disclose the identity of the subject.

Questions pertaining to personal information were required in order to examine patterns in the data and potential differences in views on risk and vulnerability between socio-demographic groups. Anonymity and confidentiality of personal data was assured. In addition, the fact that mapping could constitute part of data analysis and presentation of results was not withheld from participants, but it was stressed that the researcher would be the only individual to view this at the household scale (Section 4.7 in DPA). To ensure anonymity, questionnaire data was initially entered into SPSS with the address location of the household, but each address has been subsequently replaced with a property number which maps onto a unique property ID created in ArcGIS. Furthermore, mapping of household data is not presented within this thesis or any other related publication in a way that identifies the household location. Instead, high or broad resolution mapping is used to disguise landmark features and individual property layers removed from maps presenting the spatial distribution of participation. Moreover, the exact locations of the research have also been disguised and are referred to as a Bradford town, West Yorkshire and an Isle of Wight town, in Hampshire. Given that these locations are identifiable from referenced literature, it is even more important that the identity of participating households is disguised.

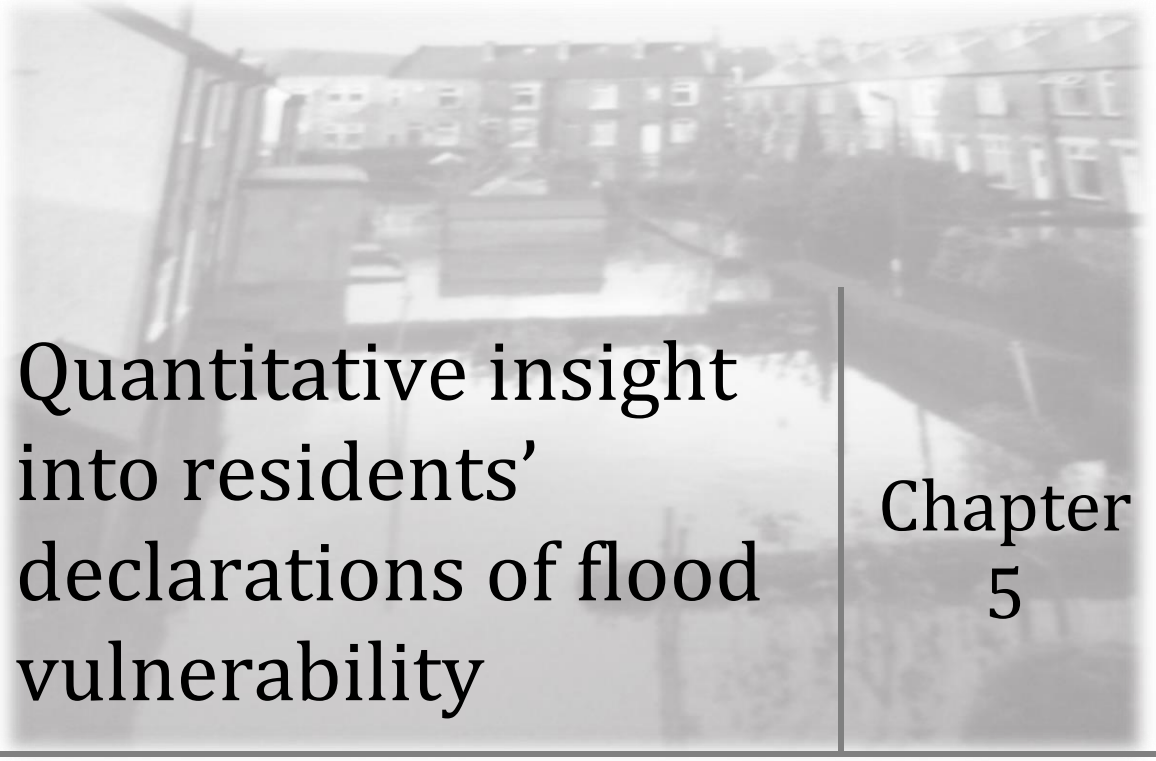
Informed and signed consent was obtained at all stages of this research and it was explained that participants had a right to withdraw at any time during the research process. A financial incentive of £15 was offered to encourage participation in in-depth interviews, recognising that 1.5 to 2 hours of someone's time requires some form of thank you.

Numerous researchers have reflected upon the power relations defining the research situation (e.g. England, 1994; Patai, 1994). Whereas participants can withhold consent or refuse to participate altogether, the researcher occupies a position of advantage, with the 'final say' in the analysis and presentation of research findings (Fisher and Anushko, 2008). Reciprocity between researcher and participant is an important ethical issue and ideally, both should benefit in some way from the research process (Creswell, 2009). At the very least the research experience should be a positive one for those involved. Follow-up questionnaires were sent to participants for self-completion, welcoming feedback on their experience of the research process. Overall, 85% (Bradford) and 92% (IOW) of participants that responded felt that their opinions mattered and 95% (Bradford) and 100% (IOW) felt able to discuss flooding within the context of issues that mattered to them. Personal comments addressed to the researcher were also very positive. Moreover, the questionnaire also showed that on a more practical

level 90% and 92% of participants in the Bradford and IOW case studies respectively, felt that the interview process had raised their awareness of flooding to some degree.

It is the responsibility of the researcher to protect the wellbeing of the participant. Flood risk is a highly sensitive issue and has been linked to physical and mental health issues, relationship breakdown and the well-being of individuals (Tapsell et al., 2002; Reacher et al., 2004); as well as the value (perceived and market) of the property. In sampling households, the researcher was conscious that while some residents may have had a negative past experience of flooding, others may not in fact be aware of local flood risk. A contact card with the Environment Agency details was made available to participants and accompanied with a briefing document to give an overview of the research and crucially, the contact details of the lead researcher. Concern for participant well-being was a greater issue where in-depth interviews were used to elicit experiences of vulnerability. Some participants shared very personal stories and upsetting experiences, sometimes beyond the topic matter. Whilst this did not occur to the point of terminating the interview or recommending further sources for support (e.g. Samaritans), it was important to ensure that the participant was in a reasonable emotional state when the interview had finished. In a few cases, participants actually welcomed the opportunity to share these experiences and memories.

Responsibility towards the participant exists beyond the data collection phase and into the transcription of interviews, analysis, interpretation and the dissemination of the research. It was important to not neglect the personal stories that arise in the research process and the voice of the participant. Dissemination of research findings is also essential to communicating 'insider voices' and ensuring that they are heard. Academic and practitioner conferences and workshops were attended throughout the course of this PhD and publications in academic journals will also aim to retain the legacy of this research. Equally important is the dissemination of research findings to those who participated and a debriefing document was sent to every individual who volunteered their time to be interviewed. Previous research in the Bradford town case study specifically, highlighted how local residents felt that their contribution to other research projects had not been appreciated (also observed in Thrush et al., 2005). Debriefing is a crucial part of the research process, not only for ensuring that participants are aware of the outcomes and feel valued, but also to ensure positive feelings towards research in general, should future researchers enter the area.



Quantitative insight into residents' declarations of flood vulnerability

Chapter 5

CONTENTS

5.1 INTRODUCTION

This chapter reports the findings from the *flood risk awareness questionnaire* and *post-interview questionnaire,* discussed in Section 4.5.4 (see also Appendix A). Collectively, these questionnaires represent etic-orientated methods, seeking a more 'distanced' perspective between the researcher and the 'researched' in the search for patterns in the data (as depicted in Figure 4.2). In this analysis, both inductive and deductive logic are employed to examine participants' views on flood hazard, risk, coping and personal vulnerability; and how these vary across socio-demographic groups and those with different levels of exposure to flood hazard, previous experience and awareness of flooding. The underlying construction of these views is analysed from qualitative data elicited from emic-orientated research methods (i.e. in-depth interviews and vignette-elicitation) and reported in Chapter 6. This chapter is steered by Research Question 1, highlighted in italics as follows;

> **RQ1**: How is vulnerability constructed and experienced by residents in locations at risk of flooding? *What are the variables influencing self-declared vulnerabilities? What are the implications of self-declared vulnerabilities?*

5.2 FLOOD RISK AWARENESS QUESTIONNAIRE

The *flood risk awareness questionnaire* was employed as a preliminary technique to provide initial insight into residents' views of flood hazard and self-declared vulnerabilities (based on the sampling strategy outlined in Section 4.4). This section reports on the emergent findings from quantitative analysis. Table 5.1 indicates the number of responses in the two selected case studies in Bradford, West Yorkshire and Isle of Wight (IOW), from which this analysis is based. The characteristics of sampled participants are summarised in Table 5.2.

Table 5.1: Summary of responses to the flood risk awareness questionnaire

Questionnaire type	Number of completed questionnaires	
	Bradford case study	Isle of Wight case study
Face-to-face questionnaire	71	19
Self-completed questionnaire	12	12
Total	**83**	**31**

Table 5.2: Key characteristics of participants sampled for the flood risk awareness questionnaire

Key characteristics	Bradford case study	Isle of Wight case study
Details related to flooding:		
Exposure to pluvial flooding, located within;		
1 in 30 year boundary (Bradford) / 1 in 20 year boundary (IOW)	58%	45%
1 in 50 year boundary	63%	48%
1 in 100 year boundary	64%	77%
1 in 200 year boundary (EA surface water flood map)	41%	61%
Located within fluvial floodplain (Bradford only)	47%	
Previous flood experience (water entered property)	40%	7%
Registered to receive flood warning	68%	7%
Socio-demographic details;		
Age: 18 – 25 years	17%	0
Age: 26 – 45 years	37%	29%
Age: 46 – 65 years	25%	29%
Age: 66 years+	21%	42%
Gender: Female	69%	55%
Gender: Male	31%	45%
Position in household: Live alone	18%	36%
Position in household: Live with partner/spouse, no children	23%	32%
Position in household: Live with partner/spouse, with children	42%	32%
Position in household: Single parent	8%	0
Position in household: Live with immediate and wider family	8%	0
Limiting long-term illness or disability	21%	13%
Ethnicity: White British	64%	94%
Tenure: Owned/mortgaged	77%	84%
Tenure: Rent (private)	14%	10%
Tenure: Rent (social)	9%	7%
Length of residency: Less than 1 year	10%	10%
Length of residency: More than 1 year, less than 5 years	11%	16%
Length of residency: 5 to 10 years	29%	32%
Length of residency: More than 10 years	51%	42%

* To nearest whole number

5.2.1 RESIDENTS' VIEWS ON EXPOSURE TO FLOODING

The reviewed literature in Chapter 2 demonstrated the importance of understanding constructions of risk from the perspective of the lay public (e.g. Burningham et al., 2008). Research has shown that risk is often constructed in terms of the hazard (i.e. likelihood of occurrence) and acts as a trigger for personal appraisals of coping (Grothmann and Reusswig, 2006; Steinführer et al., 2009). Simultaneously, views of personal vulnerability may influence constructions of risk (Poumadére et al., 2005: Moran-Ellis et al., 2006). In light of this existing literature, this section analyses residents' views on their exposure to flooding. This was addressed through two key questions in the questionnaire, based on Likert scales:

> **Q18**: In your opinion, on a scale of 1 to 5, with 1 being very unlikely and 5 being very likely, what is the likelihood of your home being flooded?
>
> **Q26**: In your opinion, on a scale of 1 to 5, with 1 being very unlikely and 5 being very likely, what is the likelihood of flooding in [town name]?

The likelihood of flooding is addressed both in the context of the property and the local area. In the forthcoming discussion, these variables are referred to as "*property exposure*" and *"town exposure*", respectively. As discussed in Chapter 4, these variables represent the subjective perspectives of residents in the area and may be at odds with objective formulations of hazard exposure derived from pluvial modelling (Allitt et al., 2009; Chen et al., 2010), and Environment Agency flood maps (Section 4.4.1); collectively, these flood maps are referred to as "*objective boundaries of hazard exposure*" (see Table 4.7). In this section, a number of hypotheses are addressed using non-parametric statistical tests. For ease of reading, results are firstly described for the Bradford case study and then the Isle of Wight (IOW); these findings are then brought together for the purpose of interpretation in Section 5.2.1.3.

5.2.1.1 RESULTS: BRADFORD CASE STUDY

The results of this section are summarised in Appendix A1.3. In the Bradford case study, 23% and 51% of the sample considered the future possibility of flooding to their property and the town respectively, as likely to highly likely. Furthermore, Spearman's bivariate correlation between these variables revealed a significant positive correlation (0.353, sig at 0.01 for 1-tail test); indicating that participants' views concerning exposure of the town are allied to their views concerning exposure to their home. It was hypothesised that residents located within the objective boundaries for hazard exposure are more likely to display higher estimates of flood likelihood, than those outside these boundaries. For the reasons explained in Section 4.5.4.1, a range of objective boundaries were examined, from frequent (1 in 30 year) to infrequent (1 in 200 year) flood boundaries. Contrary to the hypothesis, the results revealed no significant difference in views between residents living within or outside objective boundaries of exposure to pluvial or fluvial flooding.

To investigate the underlying factors shaping residents' views on flooding, all variables presented in the *flood risk awareness questionnaire* were subjected to exploratory and explanatory analysis in SPSS. Contrary to hypotheses, no significant differences in the expressed views on flood exposure emerged between households aware or unaware of flood history; households registered to receive flood warnings; or between key groups with differing socio-demographic variables (e.g. length of residency and property tenure). Variables that emerged as significant are listed in Table 5.3.

Table 5.3: Significant variables in understanding residents' views of flood exposure: Bradford case study

Hypothesis	Variables	Test	Results	Summary
Views on flood exposure will be greater in residents with previous flood experience, than in residents with no flood experience at the current property. H_0: There is no significant difference in residents' views on flood exposure between those who have or have not experienced flooding at the current property.	*Property exposure* Flood experience	Mann Whitney	There is no significant difference in views of *property exposure* between residents with previous flood experience (Mdn = 3) and those with no flood experience at the current property (Mdn = 3); where $U = 740.000$, $p>0.05$, $n = 81$	Accept null hypothesis
	Town exposure Flood experience	Mann Whitney	There is a significant difference in views of *town exposure* between residents with previous flood experience (Mdn = 3) and those with no flood experience at the current property (Mdn = 4); where $U = 518.000$, $p<0.05$, $n = 80$	**Reject null hypothesis** but also reject alternative hypothesis; i.e. those with no flood experience regard flooding as more likely to occur than those with flood experience.
Views on flood exposure will be greater in residents who are unaware of local flood defences H_0: There is no significant difference in residents' views on flood exposure between those aware or unaware of flood defences.	*Property exposure* Awareness of flood defences	Mann Whitney	There is no significant difference in views of *property exposure* between residents who are aware (Mdn = 3) and unaware (Mdn = 3) of flood defences; where $U = 557.500$, $p>0.05$, $n = 81$	Accept null hypothesis
	Town exposure Awareness of flood defences	Mann Whitney	There is a significant difference in views of *town exposure* between residents who are aware (Mdn = 3) and unaware (Mdn = 4) of flood defences; where $U = 419.500$, $p<0.05$, $n = 81$	**Reject null hypothesis**
Residents with flood experience at the current property are more likely to be aware of flood	Awareness of flood defences Flood experience	Chi Square	There is a significant difference in the awareness of flood defences between flood experienced and	**Reject null hypothesis**

Hypothesis	Variables	Test	Results	Summary
defences than those with no previous flood experience. H_0: There is no significant difference in the awareness of flood defences between flood-experienced and inexperienced residents.			inexperienced households; x^2 (1) = 4.508, p<0.05, n = 82	
Views on flood exposure will be greater in households with at least one member under the age of 18yrs old. H_0: There is no significant difference in in residents' views on flood exposure between households with or without a member under the age of 18yrs old.	*Property exposure* Persons under 18yrs	Mann Whitney	There is a significant difference in views of *property exposure* between households with (Mdn = 3) and without (Mdn = 2) someone under the age of 18yrs; where *U* = 567.000, p<0.05, n = 81	**Reject null hypothesis**
	Town exposure Persons under 18yrs	Mann Whitney	There is a significant difference in views of *town exposure* between households with (Mdn = 4) and without (Mdn = 3) someone under the age of 18yrs; where *U* = 642.500, p>0.05, n = 81	Accept null hypothesis
Views of flood exposure will vary between households in different types of properties. H_0: There is no significant difference in views of flood exposure between households in different types of properties.	*Property exposure* Property type (semi-detached or terraced)	Mann Whitney	There is a significant difference in views of *property exposure* between households in semi-detached properties (Mdn = 3) and terrace properties (Mdn = 2.5); where *U* = 240.000, p<0.01, n = 70	**Reject null hypothesis**
	Town exposure Property type (semi-detached or terraced)	Mann Whitney	There is no significant difference in views of *town exposure* between households in semi-detached properties (Mdn = 3) and terrace properties (Mdn = 4); where *U* = 398.500, p>0.05, n = 70	Accept null hypothesis
Views of flood exposure will be greatest amongst residents that have had evacuation experience due to flooding. H_0: There is no significant difference in views of hazard exposure between residents with or without evacuation experience due to flooding.	*Property exposure* Evacuation (yes/no)	Mann Whitney	There is no significant difference in views of *property exposure* between residents who have experienced evacuation from flooding (Mdn = 3) and those who have not (Mdn = 3); where *U* = 724.500, p>0.05, n = 81	Accept null hypothesis
	Town exposure Evacuation	Mann Whitney	There is a significant difference in views of *town exposure* between	**Reject null hypothesis**

Hypothesis	Variables	Test	Results	Summary
{Based on whole sample}	(yes/no)		residents who have experienced evacuation from flooding (Mdn = 3) and those who have not (Mdn = 4); where *U* = 479.500, p<0.01, n = 80	
Views of flood exposure are significantly different between different categories of employment. H_0: There is no significant difference in views of flood exposure between different categories of employment.	*Property exposure* Employment	Kruskall Wallis	There is a significant difference in views of *property exposure* across categories of employment; (*H* (4) = 9.573, *p* <0.05), n =72	**Reject null hypothesis**
	Town exposure Employment	Kruskall Wallis	There is no significant difference in views of *town exposure* across categories of employment; (*H* (4) = 7.326, *p* >0.05), n =70	Accept null hypothesis
Views of flood exposure will be significantly different between households that have flood protection measures in place. H_0: There is no significant difference in views of flood exposure between households with flood protection measures in place.	*Property exposure* Flood protection (yes/no)	Mann Whitney	There is no significant difference in views of *property* exposure between households with flood protection measures in place (Mdn = 3) and those without (Mdn = 3); where *U* = 405.500, p>0.05, n = 73	Accept null hypothesis
	Town exposure Flood protection (yes/no)	Mann Whitney	There is a significant difference in views of *town exposure* between households with flood protection measures in place (Mdn = 3) and those without (Mdn = 4); where *U* = 300.500, p<0.05, n = 73	**Reject null hypothesis**
Views of flood exposure will be greatest in households that have more than one 'vulnerable' characteristic. H_0: There is no significant difference in views of flood exposure between households and the number of 'vulnerable' characteristics they display.	*Property exposure* Vulnerability category (based on calculation)	Kruskall Wallis	There is a significant difference in views of *property exposure* across categories of vulnerability; (*H* (3) = 9.990, *p* <0.05), n = 81	**Reject null hypothesis**
	Town exposure Vulnerability category (based on calculation)	Kruskall Wallis	There is no significant difference in views of *town exposure* across categories of vulnerability; (*H* (3) = 1.576, *p* >0.05), n = 81	Accept null hypothesis

Flood experience has been widely cited in the literature as a key explanatory variable in the perception (or "construction") of risk (see Chapter 2). However, in this sample, Mann Whitney

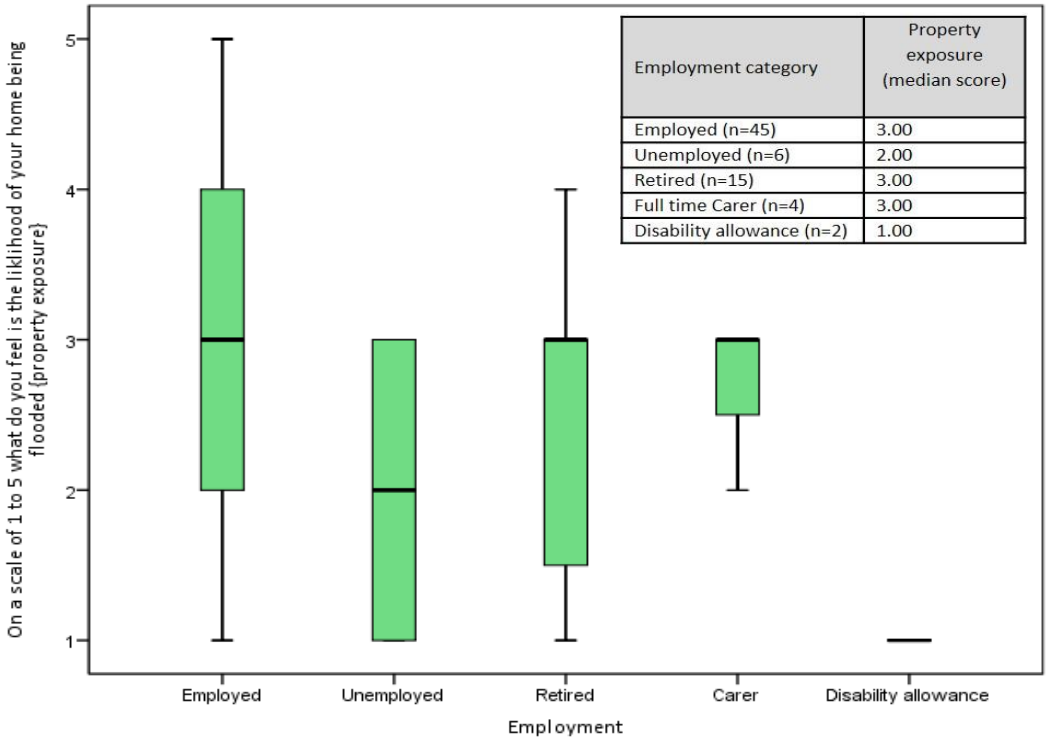
U testing showed no significant difference in residents' views on property exposure, between flood-experienced or inexperienced households. However, significant differences were observed for views concerning *town exposure*, between households who have experienced flooding at least once (Mdn= 3) and households with no flood experience at the current property (Mdn = 4); where $U = 518.000$, $p<0.05$ (n = 80). This finding indicates that estimates of flood likelihood are in fact much greater in households with *no* flood experience. Further analysis revealed that households with no flood experience were less likely to be aware of local flood defences; and in turn, estimates of *town exposure* are greatest in residents who are unaware of **flood defences** (Table 5.3). The Mann Whitney U test also demonstrated that households *without* property-scale **flood protection measures** in place were more likely to regard flooding in the town as a *likely* possibility. Chi Square analysis identified a significant difference in the purchase of flood protection between household experiences of flooding (where experience includes all encounters with flooding, both at current property and elsewhere; x^2 (1) = 7.473, $p<0.01$, N = 74). Whereas 31.3% of flood experienced households had some form of protection in place (n = 48), this compared to only 3.8% in inexperienced households (n = 26); thus indicating that flood experienced households are more likely to have some form of flood protection measure to minimise flood damages.

Additionally, higher estimates of flood likelihood in the *town*, are evident in those who have never **evacuated** a property due to flooding in the past (n=80). This latter finding included those that have experienced flood evacuation *elsewhere* and those with no previous flood experience. Further analysis sought to isolate the effects of evacuation on views concerning flood exposure and therefore examined only those participants that had encountered flooding (i.e. removing flood inexperienced households) and examined evacuation experience in general; as well as evacuation experience at the current property (see Appendix A1.3). Significant differences did emerge in both samples and demonstrate that estimates of *town exposure* are elevated amongst those that have had no experience of flood evacuation. Additional analysis showed that households with evacuation experience were more likely to have flood protection measures in place (x^2 (1) = 7.485, $p<0.01$, n = 74) and be aware of local flood defences (x^2 (1) = 7.466, $p<0.01$, n = 82).

Several variables also emerged as significant in understanding residents' views concerning the flood exposure of their *property*. Statistical tests revealed that higher estimates of flood likelihood are evident in households with at least one member under the age of eighteen years

old, as well as being significantly varied between different **employment categories** (Figure 5.1). Moreover, the ***type* of property** also emerged as a significant variable in understanding residents' estimates of *property exposure*, which were higher in households in semi-detached (rather than terraced) properties (Table 5.4). This latter finding raised questions concerning the influence of tenure (owned versus rent) of different property types; however, non-parametric difference testing revealed no significant difference in the estimates of *property exposure*, between these different categories of tenure[37], thus property tenure was rejected as a potential underlying explanation for this finding. Further analysis investigated whether certain property types are positioned in areas more likely to flood; however, the Chi statistic was non-significant (x^2 (1) = 1.185, p>0.05, n = 72). Furthermore, there was no significant difference in flood experience between different types of property in the area (x^2 (1) = 1.046, p>0.05, n = 71).

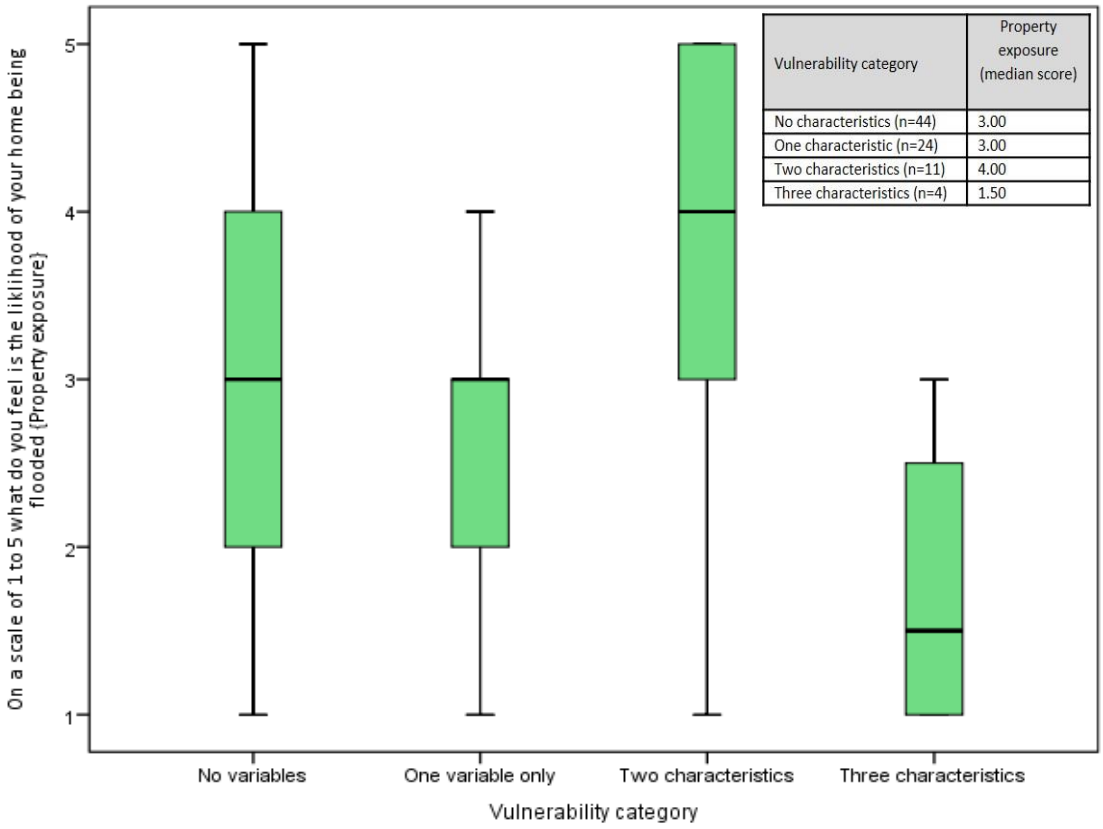
[37] Tenure was examined as categorical (nominal) variable; including the categories of owned out-right, owned with mortgage, rent (social) and rent (private); and as a binary nominal variable (owned or rented). Kruskall Wallis and Mann Whitney U tests were respectively applied to test for difference in constructions of hazard between these categories.



Employment category	Property exposure (median score)
Employed (n=45)	3.00
Unemployed (n=6)	2.00
Retired (n=15)	3.00
Full time Carer (n=4)	3.00
Disability allowance (n=2)	1.00

Figure 5.1: Boxplot to illustrate how residents' estimates of the likelihood of flooding to their property (referred to here as "property exposure"), vary across categories of employment: based on the *flood risk awareness questionnaire*, Bradford study. Median values for each employment category are indicated in adjacent table.

Although non-parametric difference tests identified no significant differences in views of flood exposure between socio-demographic characteristics of the sample when analysed individually; significant differences were identified in residents' views concerning *property exposure* between **categories of vulnerability** (Table 5.3). Here, vulnerability was scored by the researcher on the basis of so-called vulnerable characteristics of the household and aggregated in an additive model (as described in Table 4.6, "researcher-identified vulnerability category"). This approach has some resonance to the etic-orientated constructions of vulnerability reviewed in the literature, which assume that households with a combination of these characteristics are more likely to be vulnerable to flooding (Section 2.5). Figure 5.2 illustrates how residents' views vary across these categories and shows that households with two 'vulnerable' characteristics are more likely to consider their property to be exposed to flooding, while those with three are least likely to consider flooding as a possibility. These findings are interpreted in Section 5.2.1.3.



Vulnerability category	Property exposure (median score)
No characteristics (n=44)	3.00
One characteristic (n=24)	3.00
Two characteristics (n=11)	4.00
Three characteristics (n=4)	1.50

Figure 5.2: Boxplot to illustrate how residents' estimates of the likelihood of flooding to their property (referred to here as "property exposure"), vary across researcher-identified categories of vulnerability[38]. Results are based on the *flood risk awareness questionnaire* (Bradford), with median values for each vulnerability category indicated in adjacent table.

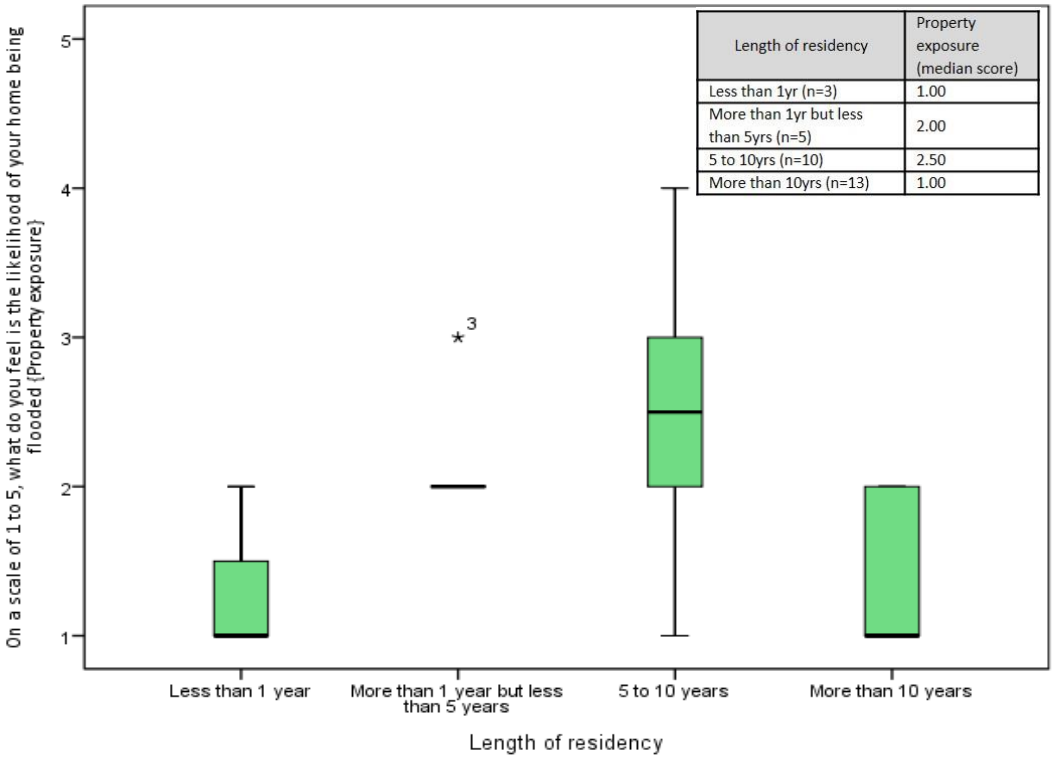
5.2.1.2 RESULTS: ISLE OF WIGHT CASE STUDY

The results of this section are summarised in Appendix A1.4. In the Isle of Wight (IOW) case study, 93.5% of participants felt that flooding in the town was likely or very likely to occur, compared to only 9.7% who felt there was an actual possibility of flood occurrence to their property. While the distribution of scores for *property* and *town exposure* are positively and negatively skewed (respectively), these variables were not significantly correlated amongst the whole sample, or when the sample was split between households located within or outside objective boundaries of flood hazard. The median scores in these data show that while the majority of households sampled feel there is a strong likelihood of future flooding in the town (Mdn = 5), flooding to the actual property is considered to be unlikely (Mdn = 2).

[38] Where vulnerability is deduced from the number of 'vulnerable' characteristics of the household; including households with someone over the age of 75yrs, someone with a limiting long-term illness and/or disability, single parent households, non-home ownership and unemployed (see Table 4.6).

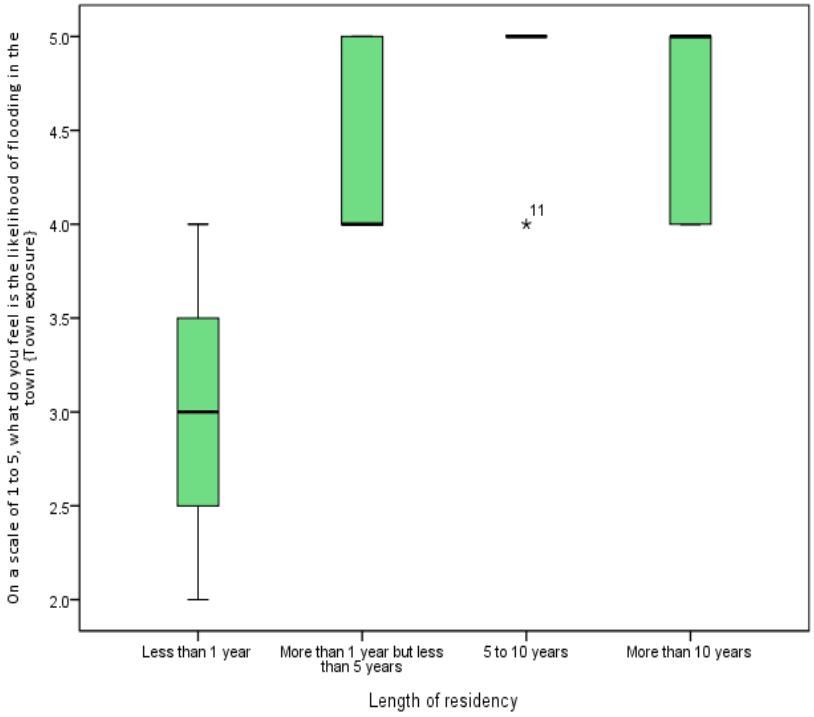
Subjective estimates of flood exposure (i.e. declared likelihood of flooding) were examined between households located within a range of objective boundaries for pluvial flooding, according to the scenarios listed in Table 4.7 (derived from Allitt et al., 2009; Environment Agency, 2013). The results from Mann Whitney difference testing revealed no significant differences in residents' views between households objectively exposed or not exposed to flood hazard.

Quantitative analysis of questionnaire data from the IOW study proved problematic given the low response rate, which limits the extent to which hypotheses can be tested and accepted or rejected with confidence. No significant differences were observed in the views expressed between different socio-demographic groups. Unlike the Bradford case study, no significant differences were observed between those aware or unaware of local flood defences; in households with someone under the age of 18 years; or between different property types. Kruskall Wallis testing revealed significant differences observed in residents' estimates of *property exposure* (where H (3) = 11.353, p <0.01, n = 31) and *town exposure* to flooding (H (3) = 12.147, p <0.01, n = 31) between different **lengths of residency** in the sample (Figure 5.3 and 5.4, respectively). Although this latter finding is based on a small dataset, households that have lived in the area for between 5 to 10 years seem to regard flooding as more likely. Interestingly, whereas the views towards *town exposure* remain elevated amongst residents who have lived in the area for over 10 years, views towards *property exposure* noticeably decrease in this group.



Length of residency	Property exposure (median score)
Less than 1yr (n=3)	1.00
More than 1yr but less than 5yrs (n=5)	2.00
5 to 10yrs (n=10)	2.50
More than 10yrs (n=13)	1.00

Figure 5.3: Boxplot to illustrate how residents' estimates of the likelihood of flooding to their property (referred to here as "property exposure"), vary across categories of residency; based on the *flood risk awareness questionnaire*, IOW study. Median values for each residency category are indicated in adjacent table.



Length of residency	Town exposure (median score)
Less than 1yr (n=3)	3.00
More than 1yr but less than 5yrs (n=5)	4.00
5 to 10yrs (n=10)	5.00
More than 10yrs (n=13)	5.00

Figure 5.4: Boxplot to illustrate how residents' estimates of the likelihood of flooding in the town (referred to here as "town exposure"), vary across categories of residency; based on the *flood risk awareness questionnaire*, IOW study. Median values for each residency category are indicated in adjacent table.

5.2.1.3 INTERPRETING RESIDENTS' VIEWS OF FLOOD EXPOSURE

In both case studies it is evident that the objective boundaries for flood exposure represented in hazard mapping (listed in Table 4.7), poorly predict the subjective views of flood exposure held by sampled residents. Questionnaire analysis from this investigation reveals that those residing in an area at-risk of flooding do not display higher estimates of flood likelihood than those residing outside objective boundaries of flood hazard; instead, it appears that the subjective and objective perspectives of flooding are at odds. These findings substantiate existing research that demonstrates a disparity between the scientific formulation of risk and public understanding. For instance, research on flood *warning* and *public awareness and responses* to flooding, revealed that 41% of residential properties declared by the EA as at 'flood risk', were not aware of this risk in 2005 (Fielding and Fielding, 2008). The impact of this upon constructions of vulnerability, is highlighted as a 'thread' to follow in the analysis of in-depth interviews (Chapter 6).

This section also sought to shed light on the variables which influence residents' views on flood exposure and these are summarised in Figure 5.5. Existing research has highlighted the critical role played by flood experience in shaping household constructions of risk (e.g. Parker et al., 2009; Rose et al., 2012). While the literature is predominantly focused on the concept of *risk*, Chapter 2 observed the interchangeable nature of the terms risk and hazard, amongst the general public and even within the literature, thus these references are applicable here. For instance, Burningham et al. (2008) conclude that the assessments of local risk are often based on previous experience of flooding and demonstrate how interaction with past, minor events and local knowledge of the 'typical' flood extent can result in under-estimation of risk. Constructions of hazard exposure may become "anchored" in previous experiences (Mileti and O'Brien, 1993); otherwise described as the "availability bias" (Tversky and Kahneman, 1974). It is possible that this is accountable for the low estimates of flood likelihood event in the IOW study, for 94% of the sample were aware of local histories of flooding but did not consider themselves to be exposed to flooding. This finding is contrary to flood modelling conducted for this area, which shows nearly 50% of the sample to be located within the boundaries of the 1 in 50 year pluvial flood. Analysis of the causes of flooding listed by participants, revealed that 72**%** acknowledged the sea and tidal influence (as a full or partial cause of flooding), and accompanying questionnaire-notes revealed known local hotspots of flooding, particularly on the main high street of the town. While these households have not directly experienced

flooding to their property, indirect encounters with flooding (and the "availability" of these memories), may account for the underestimation of flood likelihood evident in this sample.

In the Bradford study, inexperienced households displayed higher estimates of flood likelihood when considering the exposure of the town. Inexperience was also linked to a lack of awareness of flood defences and this in turn was associated with higher estimates for *town exposure*. This observation suggests that it is not experience *per se*, but awareness of flood defences underlying residents' views. Moreover, this pattern was also reflected in households *without* flood protection measures to their property and additional analysis revealed that households with no previous experience of flooding were less likely to have flood protection. These findings suggest that experienced participants are more likely to be engaged with flood-related matters, as evidenced through increased awareness of flood defences and property flood protection. While it was hypothesised that these households would display higher estimates of flood likelihood, it seems that this increased engagement with flood matters (not evident in inexperienced households), actually lessens this. Observations concerning previous experience with flood evacuation are also connected to this discussion. It was originally hypothesised that households who had previously evacuated their property due to flooding might feel that flooding is more likely, given that evacuation is indicative of a significant flood event and also emotionally upsetting (i.e. negative affect); both factors proven to be influential to constructions of risk (see Section 2.3.2). However, while data analysis demonstrated the significance of this variable, it revealed that households with no evacuation experience were more likely to consider the town to be susceptible to flooding. Again, this finding was statistically connected to a lack of awareness of flood defences amongst evacuation-inexperienced households. Existing research has demonstrated how the "affect heuristic" may heighten appraisals of risk, based on the argument that events associated with negative affect are more readily recalled (Slovic et al., 2004; Keller et al., 2006). However, in this study those who have experienced flooding report lower estimates of flood exposure. This finding may be attributed to a "levee bias" and reliance upon the structural defences that have since been erected in the area (Haynes et al., 2008). Negative affect may of course drive residents' willingness to believe that risk has been attenuated (as discussed by Harries, 2008). The extent to which these biases may influence residents' constructions of vulnerability is highlighted here for further in-depth investigation (Chapter 6).

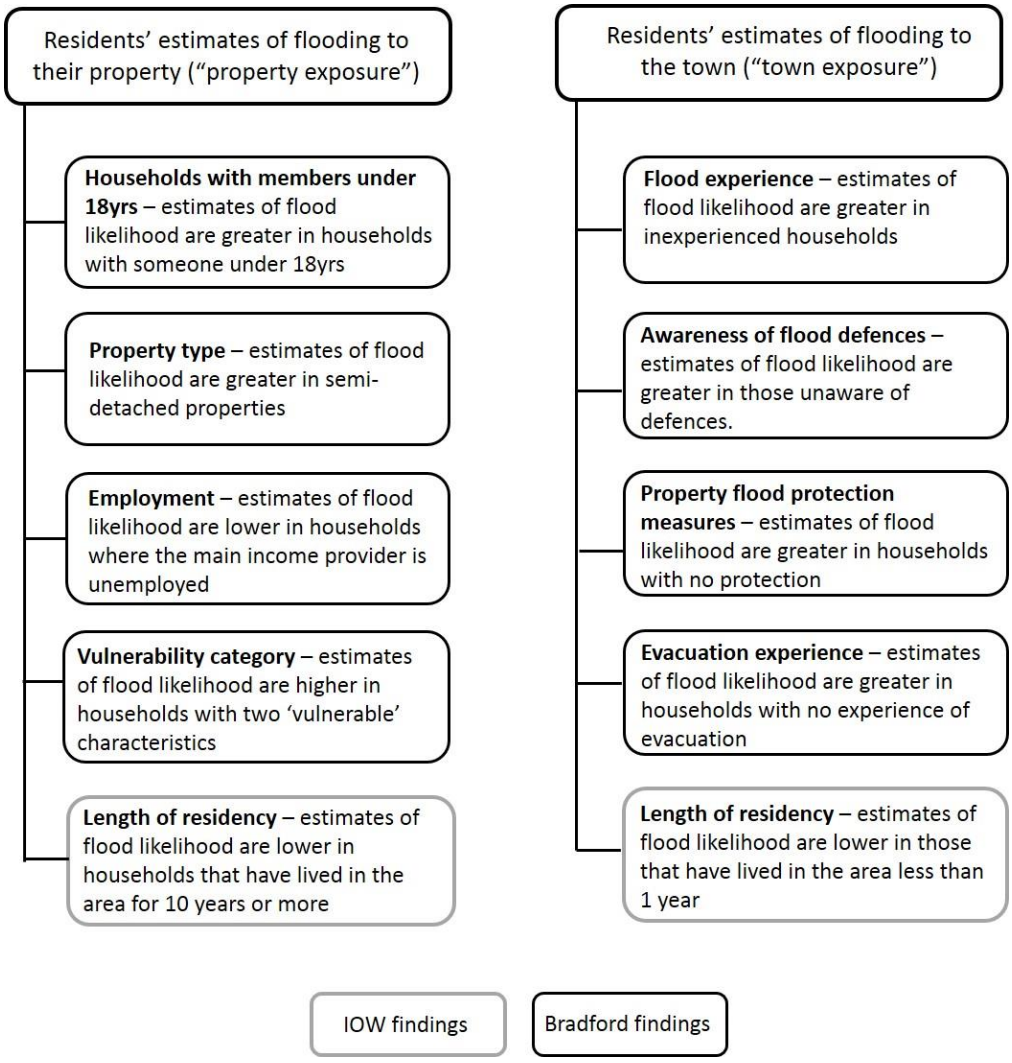


Figure 5.5: Significant variables for understanding residents' views towards flood exposure in Bradford and IOW case studies; based on the analysis of responses obtained from the flood risk awareness questionnaire

In the Bradford case study, households with members under the age of 18 years were more likely to feel that flooding in the property was a greater possibility. This finding suggests an underlying emotional reaction to flood hazard and is connected to debates in the literature discussed in chapter 2, concerning rational versus emotional models of risk perception ("construction"). For instance, Sjöberg (1998) argues that sensory-threatening risks (e.g. thunderstorm) evoke an emotional reaction and can therefore be defined as an *emotional risk* and evidenced through increased worry. Furthermore, parenthood has been shown to influence perceptions of worry (Sjöberg, ibid). Arguably flooding is closely aligned to Sjöberg's concept of 'emotional risk' for it is linked to sensory triggers (e.g. heavy rainfall). In this context, this finding arguably highlights the influential role of emotions in shaping views of hazard exposure.

Interestingly, property *type* emerged as a significant variable, with higher estimates of flood likelihood evident amongst participants in semi-detached properties. It was not the case that semi-detached properties were located in areas more exposed to flooding, or that participants in these properties have encountered flooding in the past. Tenure has emerged in existing research as a significant predictor of risk awareness, revealing that renter-occupiers are less likely to be aware of flood risk than home owners (Thrush et al., 2005b: Burningham et al., 2008); however, it is not shown to be significant in either case study assessed in this research. Another possible explanation for this finding is the potential difference in property values between semi-detached and terrace properties as an indicator for *class*. Existing UK research has shown that those in lower social classes are less likely to demonstrate flood awareness (Burningham et al., 2008). Related to understanding possible class differences are the observations concerning employment; indeed, in this research, lower estimates of *property exposure* were reported by households where the main income provider is unemployed or on disability living allowance. Again, sample size limits exploratory analysis of potential underlying variables to this finding. While secondary data analysis of large-scale survey data conducted by Burningham et al. (2008), did not find employment to be a significant explanatory factor of risk awareness, qualitative analysis conducted by the same researchers demonstrated that flooding can be underestimated in the context of everyday life and daily pressures (Burningham and Thrush, 2004: Burningham et al., 2008). It is possible that the emergence of the importance of employment in the dataset presented here is indicative of this. The *contextualist* perspective advocated by Sturgis and Allum (2004) highlights the importance of understanding the context in which knowledge is embedded, assimilated and understood. Other authors have also emphasised how the saliency of risks may vary between people and place (Paton et al. 2001; Paton and Johnson, 2001; McIvor and Paton, 2007). Constructions and evaluations of hazard, risk and vulnerability, within the context of daily life, will be examined in more depth in the forthcoming chapter.

Significant differences in residents' views towards *property exposure* were also reported between vulnerability categories; where vulnerability was assessed on the basis of so-called 'vulnerable' characteristics of the household. Whilst households with two characteristics seemed to display higher estimates of flood likelihood, there was no linearity in this pattern and the lowest scores were reported by households with three 'vulnerable' characteristics. The sample size was small in these groups, which somewhat limits the confidence in this finding.

Furthermore, the limited sample size prevents Chi Square analysis of potential underlying explanatory variables; namely the previous flood experience of these groups, or their location on the floodplain, which might account for this observation. One interpretation is that certain socio-demographic characteristics (and a combination of these) may influence views of flood exposure, perhaps reflecting the nature of social norms of vulnerability (as discussed in Poumadére et al., 2005). This is examined further in the next section but was also a critical question in the analysis of in-depth interviews.

Research conducted by Thrush et al. (2005b) also found length of residency to be a significant explanatory variable in predicting household awareness of flood risk and found that greatest awareness was evident in those who have lived in the property for one year or more. This finding is echoed here in the recorded views towards *property* and *town exposure* evident in the IOW sample. Interestingly, residents' estimates concerning the likelihood of flooding to their property are also significantly lower amongst households who have resided in the area over 10 years. In this sub-sample, only one participant had experienced flooding to the property and two participants had experienced flooding in the garden; compared to 77% of participants who had not experienced flooding in this time. It could be argued, that the lack of flood experience in this time reaffirms in residents the belief that flooding is not likely to occur in the future. This reflects an unspoken assumption that floods occurring in the future will be identical to those encountered in the past and reflects the "availability heuristic" previously described.

Key differences between selected case studies:

- Data analysis was more effective in the Bradford study where a higher number of residents participated. The low response rate in the IOW study is an important finding in itself. Analysis of questionnaire data suggests that the majority of residents sampled do not consider themselves to be personally exposed to flooding; contrary to the scientific modelling and mapping conducted for this area. Although only 23% of residents sampled in the Bradford study felt personally exposed to flooding, 40% had previously experienced flooding in the area (compared to 7% of residents in the IOW). These observations highlight the importance of residents' *subjective views of flood exposure* and *previous encounters with flooding* in motivating participation in flood

research; this has implications for studies of "insiderness" and is returned to in Chapter 9.

- Objective boundaries of flood exposure represented in hazard mapping poorly predict subjective views of flood exposure held by sampled residents.

- In the IOW study, this may be attributed to the "availability heuristic" and normalisation of flooding in specific "hotspots" (often located away from residential properties); as well as lack of primary experience amongst those sampled.

- In the Bradford study, residents with previous flood experience are more engaged with flood-related matters. Awareness of fluvial flood defences lessens estimates of exposure ("levee bias"), even though these defences heighten the risk of pluvial flooding (Chapter 3).

- Other variables for understanding residents' views of flood exposure emerged in the Bradford study. Analysis showed that households with members under the age of 18 years report higher estimates of exposure, indicating the potential influence of emotions in appraisals of flooding. Reported differences between property-types and employment suggest that income and class may also be relevant. Furthermore, it was argued that a *contextualist* perspective is required to understand the saliency of flooding within the context of daily life.

- Analysis of data elicited in Bradford provided evidence to suggest that estimates of flood exposure vary between households depending on the number of so-called vulnerable characteristics; potentially reflecting the influence of social norms of vulnerability (as documented by Poumadére et al., 2005).

These findings are highlighted as emergent 'threads' to follow into the in-depth, qualitative analysis of this study (reported in Chapter 6). At the start of this section, it was argued from the literature reviewed in Chapter 2 that understanding residents' views towards the hazard may prove important for understanding self-declared vulnerabilities, and vice versa. This chapter now turns its attention to the analysis of self-declared vulnerabilities.

5.2.2 SELF-DECLARED VULNERABILITIES

Self-declared vulnerability was assessed in the questionnaire as an open-ended question in order to elicit the range of possible interpretations of the term "vulnerability", and transformed for the purpose of quantitative analysis into a nominal, binary variable (yes, no). In addition, the sample was examined as a whole and then divided to examine this relationship between households within/outside objective boundaries for flood exposure. Despite the limitations of this approach (outlined in Table 4.5), this section reports the findings of this analysis. The results of this section are summarised in Appendix A1.3 (Bradford) and A1.4 (IOW).

5.2.2.1 RESULTS FOR SELF-DECLARED VULNERABILITY

Table 5.4 summarises the main findings from the Bradford study. A significant difference is observed in residents' estimates of the likelihood of flooding to their property (i.e. *property exposure*), between those who do or do not consider themselves to be vulnerable to flooding. The Mann Whitney U test showed that those who declared themselves as vulnerable tend to report higher estimates of *property exposure* than those who do not consider themselves to vulnerable (where $U = 395.50$, $p<0.05$, $n = 71$). Interestingly, this pattern was observed in households located *outside* the fluvial floodplain and in properties not exposed to pluvial flooding. However, a significant difference was also observed in residents' estimates of *property exposure* between those who declared themselves as vulnerable (Mdn = 3), and those who did not (Mdn = 2), amongst those residing *within* the 200 year boundary for surface water flooding (as depicted by the EA mapping). Estimates of the *town's exposure* to flooding were also significantly varied between residents who declared themselves as vulnerable and those who did not, amongst those residing *outside* the 1 in 100 year objective boundaries for pluvial flooding. Essentially, these findings indicate that those who declare themselves as vulnerable are more likely to regard flooding to the property as a possibility; even though these participants are not necessarily located within the hazard boundaries derived from flood modelling and mapping. This observation is also supported through Chi Square analysis, which showed no significant differences in declared vulnerability between objective boundaries for fluvial and pluvial flooding; suggesting that it is not the actual exposure to the hazard but the subjective perspective of flood exposure held by residents that partly accounts for declarations of vulnerability.

Chi square tests were performed on these data to test for differences in household-declared vulnerability between key socio-demographic characteristics of the sample. The characteristics (or variables) selected were based on the literature review of indicator/index based research which has dominated etic-based assessments and mapping of social vulnerability (Section 2.5); this included the elderly, households with a limiting long-term illness and/or disability, single parent households, unemployment and non-home ownership[39]. These variables were examined in isolation and then combined to form an additive model of vulnerability. While sample size limited the extent to which these tests could be calculated, no significant differences were identified in declared vulnerability, between households with someone suffering from a long-term illness or disability; non-home owners; or the calculated vulnerability category of the household. Chi Square was also applied to examine the predictive capabilities of the SFVI and revealed no significant difference in declared vulnerability between the different SFVI categories of the household (based on Tapsell et al., 2002). Additional analyses examined declared vulnerability in the context of other key variables asked in the questionnaire, namely flood experience and awareness of flood defences, but no significant differences were identified.

Table 5.4: Findings from analysis of self-declared vulnerabilities, obtained from the *flood risk awareness questionnaire*; Bradford study

Hypothesis	Variables	Results
Residents who report higher estimates of flood likelihood, are more likely to consider themselves to be vulnerable. H_0: There is no significant difference in residents' views of flood exposure between residents with different declared vulnerabilities.	*Property exposure* Declared vulnerability	There is a significant difference in residents' views towards *property exposure* between residents self-declared as vulnerable (Mdn = 3) and those who do not consider themselves to be vulnerable (Mdn = 2); $U = 395.50$, $p<0.05$, n = 71 Sample split according to **objective fluvial exposure**: A significant difference was recorded amongst participants residing *outside* the fluvial floodplain; $U = 75.000$, $p<0.05$, n = 35 Sample split according to **objective pluvial exposure:** ➢ A significant difference was recorded amongst participants residing *outside* the 1 in 50 year pluvial flood boundary; $U = 40.500$, $p<0.05$, n = 26. ➢ A significant difference was recorded amongst participants residing *outside* the 1 in 100 year pluvial flood boundary; $U = 32.500$, $p<0.05$, n = 25 ➢ A significant difference was recorded amongst participants residing *within* the 1 in 200 year pluvial flood boundary; $U = 51.000$, $p<0.05$, n = 28
	Town exposure	There is no significant difference residents' views towards *town exposure* between residents self-declared as vulnerable (Mdn = 4) and those who do not consider themselves to be vulnerable

[39] Note these characteristics constitute 5 of the 7 socio-demographic characteristics used in the Social Flood Vulnerability Index (SFVI, Tapsell et al., 2002). The two missing characteristics included household over-crowding and access to a vehicle.

Hypothesis	Variables	Results
	Declared vulnerability	(Mdn = 3); *U* = 469.50, p>0.05, n = 70 Sample split according to **objective fluvial exposure**: No significant differences identified Sample split according to **objective pluvial exposure:** A significant difference was recorded amongst participants residing *outside* the 1 in 100 year pluvial flood boundary; *U* = 30.000, p<0.05, n = 23
Residents exposed to fluvial flooding are more likely to consider themselves to be vulnerable. H_0: There is no significant difference in declarations of vulnerability between households located within or outside the fluvial floodplain	Fluvial exposure (objective) Declared vulnerability	Chi Square shows no significant difference in declared vulnerability between households located within or outside the fluvial floodplain; x^2 (1) = 0.087, p>0.05, n = 72
Households with a greater exposure to pluvial flooding are more likely to consider themselves to be vulnerable H_0: There is no significant difference in declarations of vulnerability between households with difference degrees of exposure to pluvial flooding.	1 in 30 year pluvial flood boundary Declared vulnerability	Chi Square shows no significant difference in declared vulnerability between households located within or outside the 30yr pluvial boundary; x^2 (1) = .427, p>0.05, n = 72
	1 in 50 year pluvial flood boundary Declared vulnerability	Chi Square shows no significant difference in declared vulnerability between households located within or outside the 50yr pluvial boundary; x^2 (1) = .003, p>0.05, n = 72
	1 in 100 year pluvial flood boundary Declared vulnerability	Chi Square shows no significant difference in declared vulnerability between households located within or outside the 100yr pluvial boundary; x^2 (1) = .020, p>0.05, n = 72
	1 in 200 year pluvial flood boundary Declared vulnerability	Chi Square shows no significant difference in declared vulnerability between households located within or outside the 200yr pluvial boundary; x^2 (1) = .003, p>0.05, n = 72
Households with one or more 'vulnerable' characteristic are more likely to consider themselves to be vulnerable than those without any 'vulnerable' characteristics. H_0: There is no significant difference in declarations	Declared vulnerability Illness and disability (combined) Non-home owners	Chi Square shows no significant difference in declared vulnerability between households with "vulnerable" characteristics, these included; **Illness/disability**; x^2 (1) = 3.511, p>0.05 **Non-home owners**; x^2 (1) = 1.191, p>0.05 The following characteristics could not be tested using Chi Square due to violated assumption of expected frequencies; **Single parent, unemployed**, **Elderly** and **Live alone**.

Hypothesis	Variables	Results
of vulnerability between households with or without so-called 'vulnerable' characteristics.		
	Declared vulnerability Vulnerability category	Chi Square shows no significant difference in declared vulnerability between households of different vulnerability categories; x^2 (2) = .990, p>0.05, n = 72
Households located in areas of greater vulnerability (according to the SFVI), are more likely to consider themselves to be vulnerable H_0: There is no significant difference in declarations of vulnerability between households located in different areas of classified vulnerability, based on the SFVI	Declared vulnerability SFVI	Chi Square shows no significant difference in declarations of vulnerability between households located in different areas of classified vulnerability, according to the SFVI; x^2 (1) = 0.163, p>0.05, n = 72

Non-parametric tests were also applied to the questionnaire data obtained in the **IOW case study**. Unfortunately, the low response rate severely limited Chi square analysis of most variables and hypothesis testing[40]. Mann Whitney U tests revealed no significant differences in residents' views of flood exposure between households who declared themselves as vulnerable or not vulnerable (Table 5.5). Moreover, no significant differences were found between households located in different areas of classified vulnerability according to the SFVI.

[40] Chi Square could not be performed in most cases due to a violation in the assumption of expected frequencies. According to Field (2005) expected frequencies should be greater than 5, though it is possible for large contingency tables to have up to 20% of expected frequencies below 5; however, the result is a loss in statistical power (p686).

Table 5.5: Findings from analysis of self-declared vulnerabilities, obtained from the *flood risk awareness questionnaire*; Isle of Wight study

Hypothesis	Variables	Results
Residents who report higher estimates of flood likelihood, are more likely to consider themselves to be vulnerable. H_0: There is no significant difference in residents' views of flood exposure between residents with different declared vulnerabilities.	*Property exposure* Declared vulnerability	There is no significant difference in residents' views towards *property exposure* between residents self-declared as vulnerable (Mdn = 2) and those who do not consider themselves to be vulnerable (Mdn = 2); U = 75.000, p>0.05, n = 27 Sample split according to **objective pluvial exposure**: No significant differences identified
	Town exposure Declared vulnerability	There is no significant difference residents' views towards *town exposure* between residents self-declared as vulnerable (Mdn = 5) and those who do not consider themselves to be vulnerable (Mdn = 5); U = 83.500, p>0.05, n = 27 Sample split according to **objective pluvial exposure:** No significant difference identified
Households located in areas of greater vulnerability (according to the SFVI), are more likely to consider themselves to be vulnerable H_0: There is no significant difference in declarations of vulnerability between households located in different areas of classified vulnerability, based on the SFVI	Declared vulnerability SFVI	Chi Square shows no significant difference in declarations of vulnerability between households located in different areas of classified vulnerability, according to the SFVI; x^2 (1) = 0.767, p>0.05, n = 27

In order to assess the predictive capabilities of the SFVI, household declared vulnerability from Bradford and the IOW case studies were combined in SPSS to examine the full distribution of scores across the SFVI categories (i.e. SFVI 2 "low vulnerability", SFVI 3 "average vulnerability" and SFVI 4 "high vulnerability"). Chi square revealed no significant differences in declared vulnerability between different SFVI categories of vulnerability (x^2 (2) = 1.020, p>0.05, n = 99). Households located within areas of higher vulnerability according this index, are not more likely to consider themselves to be vulnerable to flooding[41]. It should be borne in mind that the SFVI is built on an additive model of socio-demographic characteristics only and does not account for physical exposure to flooding; which, is shown in the analysis of the Bradford study, to be important for understanding residents' declared vulnerability.

[41] Chi Square was also repeated to test for significant differences in declared vulnerability between households within different areas of deprivation, according to the Index of Multiple Deprivation (IMD); however, limited sample size meant this test could not be calculated.

5.2.2.2 INTERPRETING PATTERNS OF SELF-DECLARED VULNERABILITY

The previous section revealed a number of significant variables accounting for differences in residents' estimates of flood likelihood and revealed a disparity between the objective and subjective perspectives on flood exposure. This disparity is also apparent in examining the spatial distribution of household declared vulnerability. Despite the small sample in the IOW study, it can be concluded with some confidence that this research has provided no evidence that either the SFVI-related variables (acting alone or together), nor the scientific formulations of flood hazard exposure are useful predictors of self-declared vulnerability in either study area. However, one might argue that the hazard plays a limited role in shaping declared vulnerability in the Bradford study, where significant differences were observed in residents' views towards the exposure of their *property* to flooding. From this observation, it can be concluded that it is not the 'actual' (objective) exposure to the hazard but the subjective perspective of flood exposure (specifically *property exposure*) that is relevant to understanding patterns of self-declared vulnerability. Whilst this was not observed in the IOW study, the influence of these subjectivities upon constructions of vulnerability is identified here for further in-depth exploration in Chapter 6.

Further analysis of the Bradford dataset suggest that vulnerability is not significantly influenced by socio-demographic characteristics of the household. While no significant differences emerged when these characteristics were combined to form a 'vulnerability score' for the household, it is not necessarily the case that these characteristics are unimportant; this may simply reflect the ineffectiveness of an equal-weighted model. However, it could be concluded that socio-demographic characteristics of the household are poor predictors of household declared vulnerability. Given the low response rate in the IOW study, is it not possible to draw conclusions here.

To this point, declared vulnerability has been treated as a nominal variable and simply defined as 'yes' or 'no'. However, the main purpose of using an open-ended question was to shed light on the type of first-hand responses to the term 'vulnerability' and elicit the participant's understanding of this term. The qualitative questionnaire responses from the Bradford and IOW case studies were analysed in NVivo. Despite the recognised limitations of this approach (outlined in Table 4.5), this analysis serves to highlight the range of themes that emerged and

helped inform the topics for in-depth interviews. Figure 5.6 and 5.7 present the themes emergent from qualitative coding of Question 25 in the *flood risk awareness questionnaire* from the Bradford and IOW case studies, respectively. It is noteworthy that these themes are not mutually exclusive as some residents expressed multiple reasons why they might consider themselves to be vulnerable. Residents' responses appeared to group around a number of shared themes predominantly related to hazard-centric and social-centric concerns, though some participants also articulated emotional and logistical reasons for potential vulnerability.

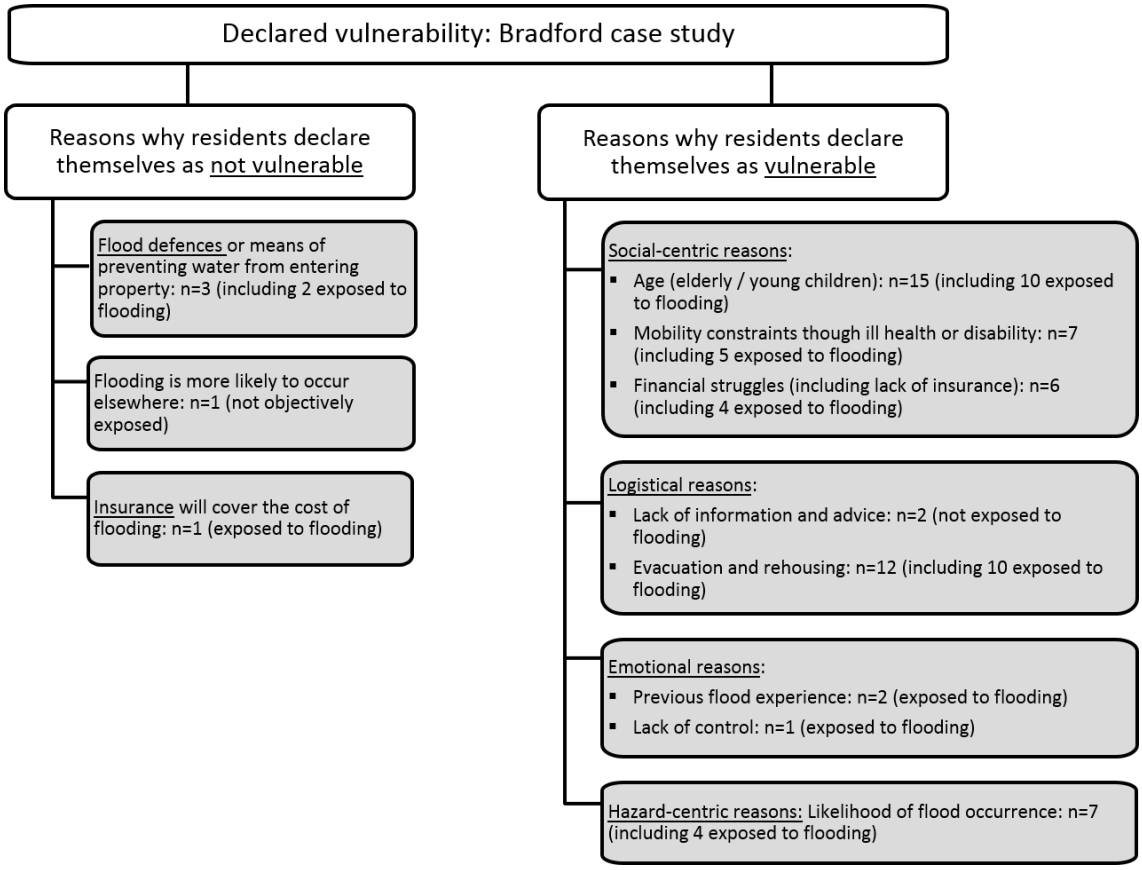


Figure 5.6: Themes identified from qualitative responses regarding reasons for household declared vulnerability; derived from the *flood risk awareness questionnaire* (Q25), Bradford study (note categories are not mutually exclusive). Exposure to flooding based on 1 in 100 year boundary for *fluvial* and *pluvial* flood.

Although quantitative analysis revealed no significant relationships between declared vulnerability and socio-demographic characteristics of the household, these characteristics were described by participants when asked to consider their potential to be vulnerable in a flood situation. Age and mobility constraints were recurrent concerns. Whereas the majority of respondents in the IOW town consider this from a hypothetical perspective, 40% of the

Bradford town participants had experienced flooding first-hand and therefore reflected on the stress and anxiety of having to evacuate and re-house. Insurance featured in both areas, as residents discussed the importance of having the correct insurance to cover the costs of flooding; as well as some concerns about the impact on insurance premiums once a claim has been made and the implications of climate change on future insurance.

Of equal interest, are the reasons disclosed when households did not consider themselves to be vulnerable. In the IOW, it appeared that residents did not consider themselves to be vulnerable because they did not regard there to be a risk of flooding to the property. Whilst this may account for the low response rate to the questionnaire survey, this finding is contrary to the scientific assessments of exposure for this area (Allitt et al., 2009). Similarly in Bradford, a couple of residents expressed feelings of safety with the flood defences now in place; again, both residents are located within objective boundaries for pluvial flooding.

In contrasting these case studies, it is apparent that similar reasons emerge for why residents may or may not consider themselves to be vulnerable. Importantly, this also includes hazard-centric reasons based on flood likelihood, revealing that subjective views of flood exposure are important to residents' appraisals of their personal vulnerability (and confirming quantitative analyses above). The reasons listed here are identified for further examination in in-depth interviews. Indeed, from the questionnaire alone it is difficult to discern the manner in which 'age' for example, informs declarations of vulnerability; in this case, age might be related to physical, emotional or even financial concerns (not recorded unless specifically stated during questionnaire completion). These themes are further developed in Chapter 6.

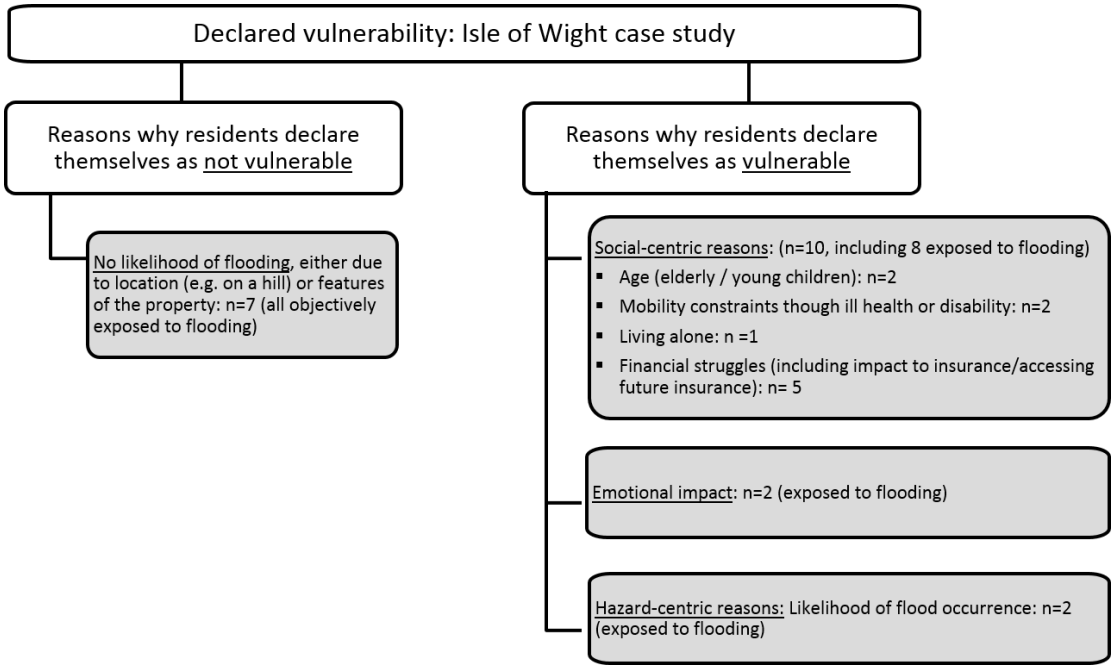


Figure 5.7: Themes identified from qualitative responses regarding reasons for household declared vulnerability; derived from the *flood risk awareness questionnaire* (Q25), IOW study (note categories are not mutually exclusive). Exposure to flooding based on 1 in 100 year boundary for *pluvial* flood.

5.3 POST-INTERVIEW QUESTIONNAIRES

Following the in-depth interviews, a *post-interview questionnaire* was administered to satisfy the objectives outlined in Section 4.5.4.2. In this questionnaire, Likert Scales were used to elicit participants' views of risk, vulnerability and resilience, to examine patterns between socio-demographic groups and those located within objective boundaries of flood exposure. Additional Likert Scales were used to examine attitudes towards flooding and FRM. Extending the scope of this analysis, the questionnaire also included items related to coping strategies and personality traits (e.g. optimism and pessimism). The *post-interview questionnaire* and a full summary of the results reported here is provided in Appendix A2. The nature of in-depth interviews means that sample sizes are typically small, which is acknowledged as a limitation for quantitative study. In total, there were 27 participants in Bradford and 13 participants in the IOW town. Nonetheless, this section reports the emergent findings from this quantitative analysis. The key characteristics of participants are summarised in Table 5.6.

Table 5.6: Key characteristics of participants who completed the *post-interview questionnaire*

Key characteristics	Bradford case study (n=27)	Isle of Wight case study (n=13)
Details related to flooding:		
Exposure to pluvial flooding, located within;		
1 in 30 year boundary (Bradford) / 1 in 20 year boundary (IOW)	70%	31%
1 in 50 year boundary	70%	39%
1 in 100 year boundary	70%	54%
1 in 200 year boundary (EA surface water flood map)	59%	54%
Located within fluvial floodplain (Bradford only)	63%	
Previous flood experience (water entered property)	44%	8%
Registered to receive flood warning	70%	8%
Socio-demographic details;		
Age: 18 – 25 years	11%	
Age: 26 – 45 years	33%	23%
Age: 46 – 65 years	22%	39%
Age: 66 years+	33%	39%
Gender: Female	74%	69%
Gender: Male	26%	31%
Position in household: Live alone	30%	31%
Position in household: Live with partner/spouse, no children	11%	39%
Position in household: Live with partner/spouse, with children	26%	31%
Position in household: Single parent	26%	
Position in household: Live with immediate and wider family	7%	
Limiting long-term illness or disability	19%	8%
Ethnicity: White British	89%	100%
Tenure: Owned/mortgaged	70%	92%
Tenure: Rent (private)	22%	8%
Tenure: Rent (social)	7%	
Length of residency: Less than 1 year	4%	8%
Length of residency: More than 1 year, less than 5 years	15%	23%
Length of residency: 5 to 10 years	11%	39%
Length of residency: More than 10 years	70%	31%

* To nearest whole number

The primary purpose of this questionnaire and analysis is to reveal quantitative insight into residents' views of risk, vulnerability and resilience. In the outset, it is important to acknowledge a fundamental assumption of this analysis, and an assumption inherent to the questionnaire method; that is, it is assumed that participants share the same understanding (and underlying construction) of the terms used in the questions. The extent to which this is true is unpicked through the qualitative analysis of in-depth interviews. This tension is further discussed in Chapter 9, which will consider the merits and insights afforded through the different methods employed in this study. This section presents the results of bivariate correlation and non-parametric difference tests, specifically focused on the following 4 variables:

- Declared risk: *'I do not consider myself to be at risk from flooding'*
- Declared vulnerability: '*I do not consider myself to be vulnerable to flooding'*
- Declared resilience: '*If my property were to flood, I would be able to cope'* (Coping self-efficacy)

  'If my property were to flood, I would soon bounce back to normal' (recovery self-efficacy)

In each case study, the sample was firstly analysed as a whole and then split between the objective boundaries of *pluvial* flood exposure; based on the 1 in 100 year pluvial flood boundary for Bradford and the IOW[42] studies. The decision to divide the dataset is justified by the need to identify variables potentially unique to each group. Equally important is the analysis of the whole sample, as this provided an opportunity to directly contrast residents' declarations and attitudes between the objective boundaries of flood exposure. Given the low participation rate in the IOW case study it was not possible to examine the responses from those not objectively exposed to flooding in isolation (n=5); however the *exposed* sample was still analysed separately (n=7). It should be borne in mind that residents sampled in the Bradford study are also exposed to fluvial flooding, which was analysed as part of this research though is not presented in-depth in this chapter (see Appendix A2.3 for full summary of these results). Instead, the decision to present the analysis of pluvial flood boundaries is justified by the need to maintain consistency with the IOW study, as well as addressing the under-researched context of pluvial flooding. Observations from the analysis of the sample *exposed to fluvial flooding* (only), are highlighted where they differ from those observed amongst those exposed to pluvial flooding.

[42] 1 in 100 year pluvial flood modelling for the IOW study site was available through Exeter University (discussed in Allitt et al., 2009) and applies the SIPSON-UIM model used by Chen et al. (2010) for the Bradford study. However, whereas the model outputs available for Bradford provide maximum depth for a 720 minute scenario; the outputs available for the IOW are only available for a 120 minute scenario. The recorded depth at T120 was used to deduce the exposure of the property (following the method described in Chapter 4). Whilst there is a risk that this under-estimates flood exposure, available data for the 1 in 200 year scenario (from the EA) was consulted and showed only 2 properties that differed between the two scenarios; these differences were resolved by consulting the recorded property details in the questionnaire data (and confirmed the accuracy of the SIPSON-UIM model).

5.3.1 FINDINGS FROM THE BRADFORD STUDY

This section contrasts the findings obtained from the analyses of those exposed or not exposed to *pluvial* flooding[43]. Although there is a strong overlap between residents exposed to fluvial (n=17) and pluvial (n=19) flooding in this study site, there were some differences in the results, which are also reported where relevant[44]. A summary of the findings presented in this section are reported in Appendix A2.

The connectivity between declarations of risk, vulnerability and resilience in the Bradford study is presented in Table 5.7. Firstly, it is apparent across all samples that declared risk and vulnerability are significantly and positively correlated; thus those who do not consider themselves to be at risk of flooding also do not consider themselves to be vulnerable to flooding. Secondly, the two variables for declared resilience are also highly correlated within the whole sample and within the sample exposed to flooding, suggesting that residents with a strong belief in their personal ability to cope also strongly believe that they would soon bounce back to normal if a flood was to occur. Finally, whilst declared risk and vulnerability are not correlated with resilience within the overall sample and sample exposed to flooding, these variables are correlated with *declared coping* within the sample not exposed to flooding. It is noteworthy that a similar pattern of connectivity was reported in the analysis of those exposed and not exposed to *fluvial* flooding. This finding could arguably reflect the nature of the wording in the questionnaire, such that the phrase "vulnerable to flooding" may have elicited responses orientated towards flood-likelihood. Alternatively, it is possible that coping and recovery self-efficacy are not sufficiently influential or important in shaping residents' declared vulnerabilities. In order to examine this connectivity further, matrices are presented in Figure 5.8 and 5.9 to contrast findings obtained from the analyses of those exposed or not exposed to *pluvial* flooding.

[43] Whilst this was based on the 1 in 100 year pluvial flood (as modelled by Chen et al., 2009); the same residents also reside within the 1 in 50 year and 1 in 30 year pluvial flood boundaries.

[44] The results of quantitative analyses for those exposed or not objectively exposed to fluvial flooding, are summarised in Appendix A2.3. These results are reported in this section only where the findings differ from those obtained through the analysis of samples exposed or not objectively exposed to pluvial flooding.

Table 5.7: Correlations between resident declarations of risk, vulnerability and resilience, based on Kendall's Tau correlation coefficient (1 tail): Bradford case study. * Significant at 0.05 ** Significant at 0.01.

Declaration	Whole sample (n=27)	Sample exposed to flooding (n=19)	Sample not objectively exposed to flooding (n=8)
I do not consider myself to be at risk of flooding	I do not consider myself to be vulnerable (.850**)	I do not consider myself to be vulnerable (.966**)	I do not consider myself to be vulnerable (.638*)
			If my property was to flood I would be able to cope (.724*)
I do not consider myself to be vulnerable	I do not consider myself to be at risk of flooding (.850**)	I do not consider myself to be at risk of flooding (.966**)	I do not consider myself to be at risk of flooding (.638*)
			If my property was to flood I would be able to cope (.696*)
			If my property was flooded I would soon bounce back to normal (.578*)
If my property was to flood I would be able to cope	If my property was flooded I would soon bounce back to normal (.606**)	If my property was flooded I would soon bounce back to normal (.657**)	I do not consider myself to be at risk of flooding (.724*)
			I do not consider myself to be vulnerable (.696*)
If my property was flooded I would soon bounce back to normal	If my property was to flood I would be able to cope (.606**)	If my property was to flood I would be able to cope (.657**)	I do not consider myself to be vulnerable (.578*)

5.3.1.1 Results from analysis of residents *exposed* to pluvial flooding, Bradford

Although residents' views of risk and vulnerability are highly significant in their correlation (.966**), they do not overlap in their correlations with other variables; with the exception of "*flooding is not a major concern*". This suggests that the two viewpoints are not altogether the reverse (or flip side) of the other (as suggested in the literature reviewed in Section 2.3.1). Moreover, the significance of this correlation is expected in light of existing research. Although causality cannot be addressed from correlation analysis, previous research has demonstrated that in order for a household to recognise and appraise vulnerability (or 'coping appraisal'), they must first perceive a threat, either to their personal safety or ontological security (Grossman and Reusswig, 2006; Harries, 2008).

In this sample, households who did not consider themselves to be at **risk** of flooding were also more likely to state that flooding is not a major concern and assert the view that as householders they should not be responsible for managing the risk to their property. The flip-side of this finding is that households who did consider themselves to be at risk, were more willing to accept part responsibility for FRM. It is noteworthy that residents' views towards personal vulnerability and resilience were not significantly correlated with attitudes towards flood responsibility. These findings have implications for the uptake and ownership of FRM measures amongst households in at-risk locations and suggest that subjective perspectives of *risk* (only) are of key interest; indeed, this may serve as both barrier and potential opportunity for encouraging household participation in FRM.

It was found that those who *do* consider themselves to be at risk also display a trait for optimistic thinking ("*I generally look on the brighter side*"). The literature reviewed in Chapter 2 (Section 2.3.2), revealed mixed interpretations of optimism. On one hand it is argued that optimism can dampen threat appraisal (i.e. "optimistic bias"; Weinstein, 1983), and therefore, people displaying this trait are less likely to adopt precautionary behaviours. However, in this study there is a positive correlation between this variable and the view that householders should be more responsible at managing the potential risk to their property; i.e. those displaying this trait for optimism are more likely to accept responsibility. Although this analysis shows that there are favourable attitudes towards the ownership of risk responsibility, this does not necessarily mean that these individuals will adopt precautionary behaviour; however, this finding suggests at least that optimism is not necessarily a barrier to adoption of risk responsibility.

Evident in this analysis is the positive correlation between **declared vulnerability** and other concerns in daily life. This finding implies that flood-related matters are surpassed by other concerns amongst the sampled residents who do *not* consider themselves to be vulnerable to flooding. With regards to FRM, this emergent finding provides further support for calls for contextual research and integration of vulnerability-thinking and management of flood vulnerabilities within the context of daily life; instead of as a separable, isolated phenomenon (Fordham, 1998; Burningham et al., 2008). It was also found that residents who consider themselves to be vulnerable in this sample, seem to exhibit a degree of pessimistic thinking ("*rarely do I expect good things to happen*"). Existing research has demonstrated that

pessimism can distort people's appraisals of risk, leading to maladaptive responses such as denial or fatalism. However this does not appear to be the case here. Instead, not only does it seem that those exhibiting this trait embrace their vulnerability, but further correlation tests show that participants displaying this pessimistic trait acknowledge household responsibility in FRM. It was further observed that declared vulnerability is inversely related to preventative coping ("*I prepare for adverse events*"). Thus those who consider themselves to be vulnerable are *less* likely to adopt preventative strategies for coping (i.e. strategies to prepare for *uncertain* future events). This form of coping is distinct from anticipatory coping, which occurs in the context of an *impending* threat, though could be equally important in shaping experiences of flood events (Schwarzer and Knoll, 2003). The analysis presented here, suggests that those who declare themselves as vulnerable may lack this trait of preventative coping, which could enhance their resilience in the aftermath of flooding.

Different findings emerged when examining the sample exposed to fluvial flooding (n=17). Here, pessimism was not significantly correlated with declared vulnerability. Instead, an inverse relationship was observed with fatalism and reflective coping, as well as a positive correlation with avoidance coping. This analysis revealed that residents who consider themselves to be vulnerable are more likely to be fatalistic in their outlook on life, more reflective (e.g. generating plans for action) and less avoidant in their coping behaviour than those who do *not* consider themselves to be vulnerable. Fatalism is often discussed as a maladaptive coping mechanism and linked to external locus of control; moreover, empirical evidence has shown the people displaying these traits are less likely to adopt preparedness behaviour (McClure et al., 1999; Rose et al., 2012). However, there was no evidence in this analysis to support this existing research. With regards to avoidance coping, this analysis suggests that those who consider themselves to be vulnerable are more willing to embrace problems encountered within everyday life.

A key observation from this analysis is that there are no significant differences in declared vulnerability between the different socio-demographic groups sampled for this study. Given etic-orientated methods of vulnerability assessment based on these characteristics (Section 2.5), this finding highlights a potential dissonance between objective and subjective perspectives of vulnerability. Here it seems that residents' views of vulnerability are not systematically varied between so-called 'vulnerable groups', but rather influenced by their

perspectives of risk, the context of daily life and individual differences in coping strategies and outlooks on life.

As previously identified, within the data collected here, views on risk and vulnerability are divorced from views concerning personal *resilience*. A positive correlation between ***declared coping*** and local-based social support networks certifies existing research highlighting the importance of support networks in coping (e.g. Aspinwall and Taylor, 1997). Also apparent from this analysis, is the significant correlations between residents' *declared coping* and strategic coping (e.g. where extensive tasks are broken down into manageable components). Although it appears that those displaying strong beliefs in their coping abilities are more likely to adopt strategic forms of coping, analysis revealed that these residents may also adopt avoidance coping strategies (e.g. delaying decision making). In this sample, whilst avoidance coping is positively correlated with non-proactive coping, it is also positively related to strategic and preventative coping, and an attitude of flood acceptance. The literature shows avoidance coping to be an undesired and maladaptive response; however, this is not necessarily apparent in this study as avoidance coping is not significantly correlated with attitudes towards responsibility or willingness to act. In the analysis of the sample exposed to fluvial flooding (n=17), declared coping was positively correlated with preventative coping, only. From this finding it may be concluded, that preventative coping is linked to higher estimates of coping self-efficacy amongst the residents sampled. Encouraging strategies for preventative coping amongst households exposed to flooding, could heighten residents' beliefs in their personal coping abilities.

Higher estimates of coping self-efficacy were also reported by those sharing the view that flooding would not create a financial problem for their household. Interestingly, Mann-Whitney difference testing showed that those residing in semi-detached properties were more likely to report low coping self-efficacy. It is noteworthy, that no significant difference was found between property type and responses concerning financial struggles; therefore, there is no evidence to suggest that this finding is connected to residents' financial situations. Previous analysis of the *flood risk awareness questionnaire* also revealed that higher estimates of flood likelihood are reported by those residing in semi-detached properties (Section 5.2.1.3). However, there is insufficient data to quantitatively assess this finding further. Furthermore, the influence of finances or property-type did not emerge as significant for understanding patterns of declared coping in the analysis of the sample exposed to fluvial flooding. Finally,

declared coping was significantly correlated with views concerning recovery (referred to here as "recovery self-efficacy"), i.e. the ability to 'bounce back' to normal.

Similarly with declared coping, those with higher estimates of their ***recovery self-efficacy***, tended to report local-based social support networks and strategic forms of coping. In addition, these residents also relied on *instrumental support seeking* as a strategy for coping (i.e. asking others for advice). This study confirms the importance of social support discussed in Chapter 2. In contrast to declared vulnerability, key differences were identified in recovery self-efficacy between different socio-demographic groups[45]. The results of this analysis revealed that whilst households with a member under the age of 18 years were more likely to feel that they would soon recover, the reverse was observed in households with members over the age or 75 years. This latter finding was also echoed in the differences observed in employment, where lower estimates of recovery abilities were expressed by retired participants. Households with child dependents are often cited in the literature as a 'vulnerable group'; however, bivariate correlations in this study demonstrate that not only is this group *not* more likely consider themselves to be vulnerable, but in fact are more likely to display strong beliefs in their ability to recover (i.e. recovery self-efficacy). One possible interpretation is that the presence of children speeds the recovery process as parents are motivated to regain a sense of normality, perhaps less for themselves and more for the sake of the children. Interestingly, households with members under the age of 18 years were also shown in previous analyses to report higher estimates of flood exposure (Section 5.2.1.3). Although this earlier finding was not echoed here in the examination of *declared risk*, it is clear that the presence of children is influential to evaluations of recovery self-efficacy.

In contrast, elderly and retired households express lower beliefs in their ability to recover. Although a positive correlation was found between views on 'bouncing back' and health status, reported health was not significantly varied between households with or without older members. Therefore, it might be interpreted that this observation is connected to an emotional (rather than physical) barrier to self-beliefs on recovery. Another interpretation, is that these views may be partially influenced by finances, given that significant differences were observed between categories of employment. Most likely, there are a number of nuanced reasons for this finding which are explored further in Chapter 6. Nonetheless, it is evident that, whilst elderly households are not more likely to consider themselves to be

[45] Identical findings were observed in the analysis of the sample exposed to fluvial flooding (n=17).

vulnerable to flooding than other social groups who participated in this research; they are more likely to articulate lower beliefs in their abilities to recover. Thus there is a degree of symmetry with etic-orientated research which typically represents the elderly as a so-called vulnerable group (Section 2.5; Tapsell et al., 2002; Cutter et al., 2003).

SUMMARY: Sample exposed to pluvial flooding, Bradford

- Declarations for risk and vulnerability are divorced from declarations for resilience (i.e. coping and recovery self-efficacy). It is not clear whether this finding reflects the wording in the questionnaire; or whether coping and recovery self-efficacy are not sufficiently influential or important in shaping residents' declared vulnerabilities. This is highlighted for further examination in Chapter 6.
- Declared risk is significantly correlated with attitudes towards household responsibility of risk; i.e. those who consider themselves to be at-risk are more likely to agree that householders should adopt more responsibility. Residents' perceptions of *risk* may therefore present a barrier or opportunity for encouraging household participation in risk management.
- Optimism is related to declared risk and attitudes towards household responsibility.
- Declared vulnerability needs to be understood within the context of daily life.
- Pessimism is correlated with declared vulnerability, but it seems that those who display this trait also embrace their vulnerability and acknowledge personal responsibility in managing the risk to their property. However, it seems that those who consider themselves to be vulnerable are less likely to adopt preventative strategies for coping. This could be detrimental to anticipatory and reactive coping, and lead to greater distress if a flood was to occur.
- There is no significant difference in declared vulnerability between socio-demographic groups sampled in this study, suggesting that residents' views of their personal vulnerability are not shaped by these characteristics *per se*.
- Coping and recovery self-efficacy are positively correlated with local-based social support networks.
- Recovery self-efficacy is significantly varied between households with members under the age of 18 years and those with members over the age of 75 years. Estimates are greater in households with under 18s, reflecting a disparity between objective and subjective perspectives. In contrast, estimates are lower in those with members over the age of 75 years, highlighting a point of synergy between objective and subjective perspectives.
- Similar findings are reported in the analysis of those exposed to fluvial flooding, though some differences were observed in the dispositional characteristics of those sampled (i.e. fatalism, optimism-pessimism and coping behaviours).

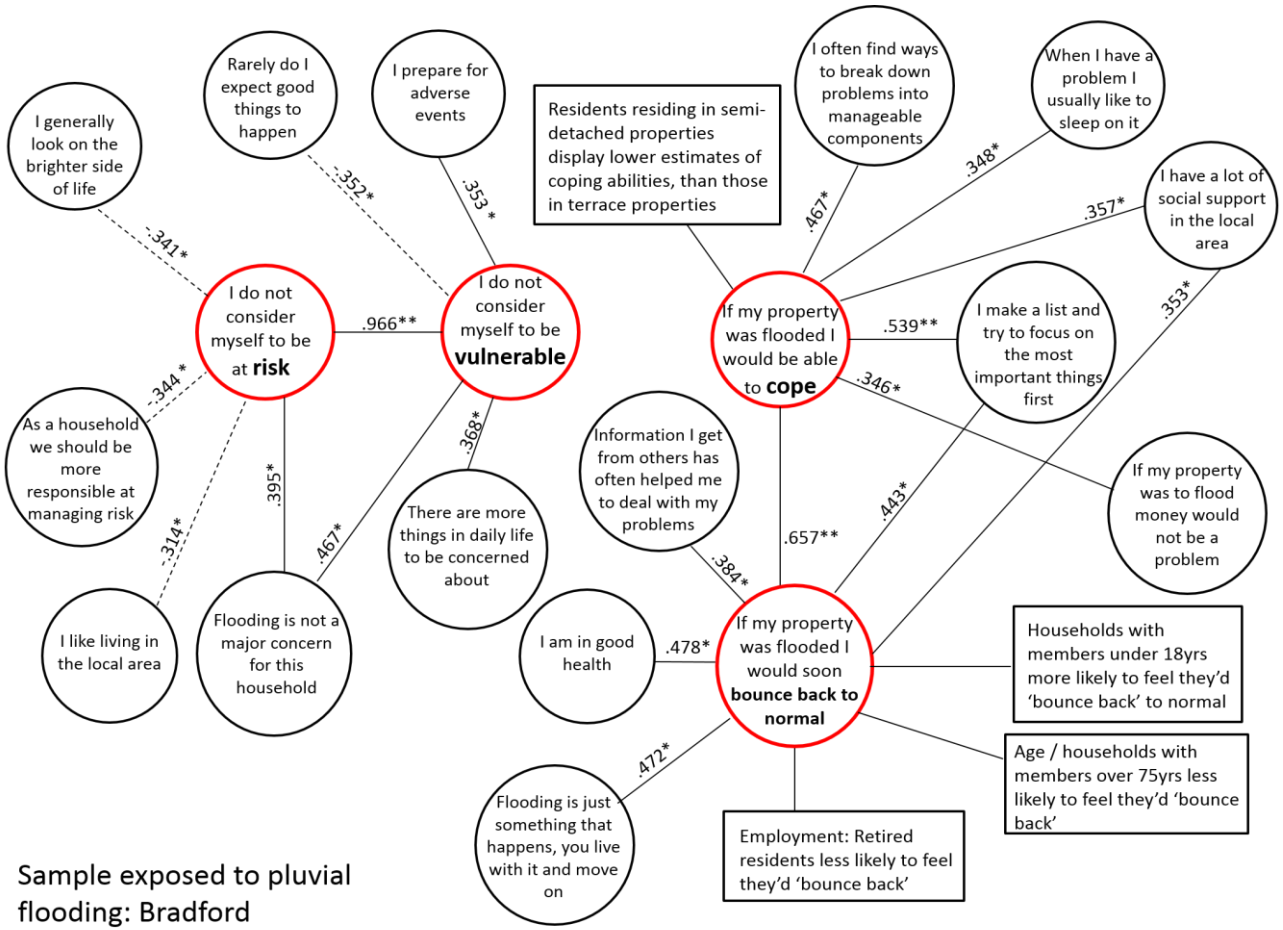


Figure 5.8: Matrix for significant variables emergent from bivariate correlation (Kendall's Tau, 1-tail and 2-tail tests) and non-parametric difference tests (indicated in boxes), obtained from *post-interview questionnaires* with residents objectively identified as <u>exposed</u> to *pluvial* flooding (according to the 1 in 100 year flood modelled by Chen et al., 2009): Bradford case study.

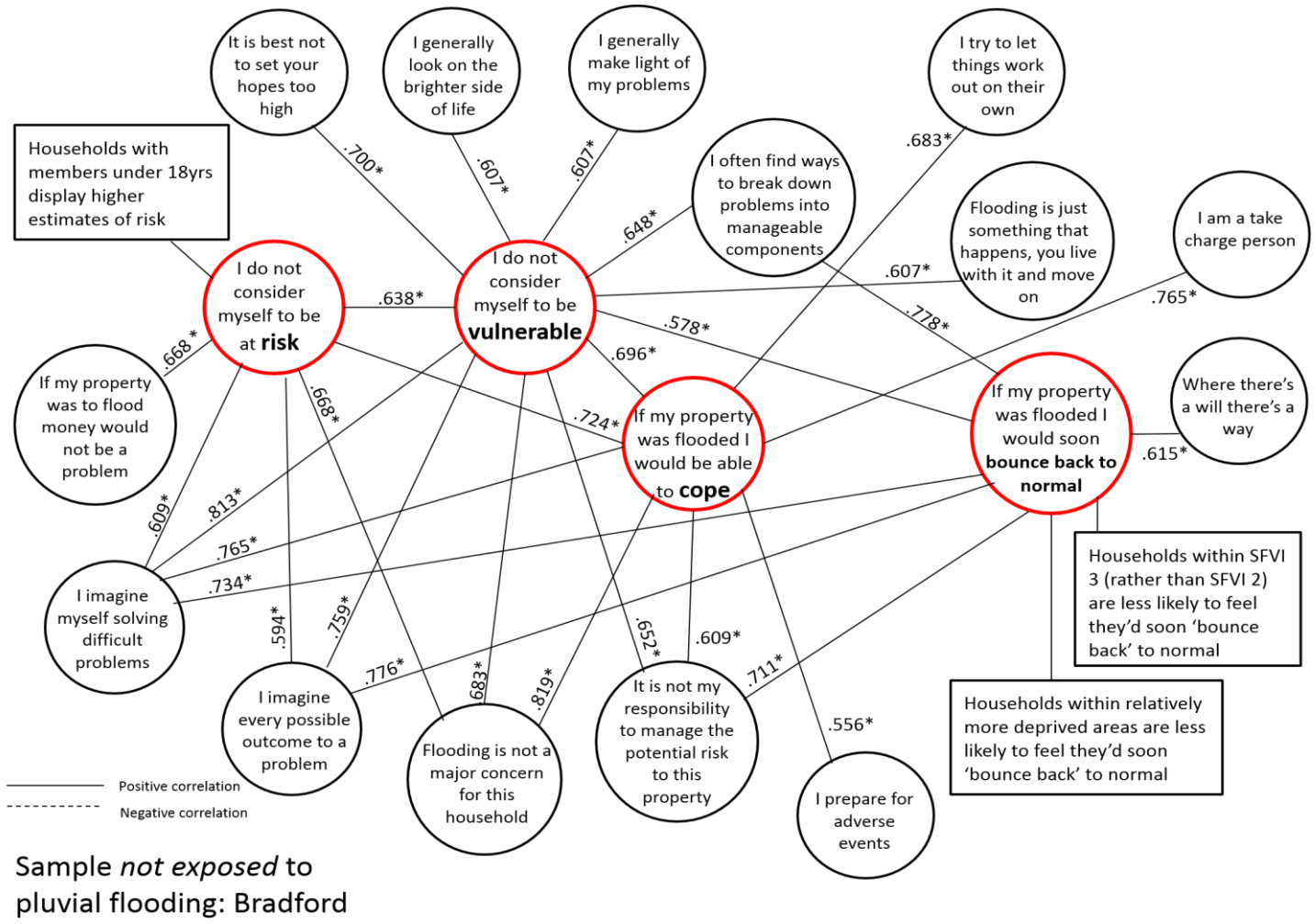


Figure 5.9: Matrix for significant variables emergent from bivariate correlation (Kendall's Tau, 1-tail and 2-tail tests) and non-parametric difference tests (indicated in boxes), obtained from *post-interview questionnaires* with residents objectively identified as <u>not exposed</u> to *pluvial* flooding (according to the 1 in 100 year flood modelled by Chen et al., 2009): Bradford case study.

5.3.1.2 Results from analysis of residents not objectively exposed to pluvial flooding, Bradford

These observations can be contrasted with the matrix produced from analysis of the sample *not* objectively exposed to flooding (n=8) and illustrated in Figure 5.9. The first observation is that **declarations of risk**, vulnerability and resilience are considerably more connected. With regards to risk, it appears that those who do not consider themselves to be at-risk of flooding, report that money would not be a problem if flooding was to occur and feel that flooding is not a major concern for their household. As observed in analysis of the *flood risk awareness questionnaire* and subjective views of flood exposure of the property, households with members under the age of 18 years display higher estimates of risk. Arguably, this finding reflects the influence of emotions in risk appraisal (discussed in Section 5.2.3.1), but also indicates a symmetry between the etic assignment of vulnerability to this group, and the subjective perspective of *risk* expressed by this group.

Declared vulnerability is confusingly correlated with traits for optimism and pessimism; i.e. those who do not consider themselves to be vulnerable display both optimistic and pessimistic outlooks on life. This evident contradiction highlights the complicated relationship between optimism and pessimism, and the non-binary nature of this relationship. Furthermore, there appears to be less *acceptance* of flooding (i.e. 'flooding is just something that happens'), amongst those who would consider themselves to be vulnerable. Even though this sample are not objectively exposed to flooding, this finding highlights how attitudes concerning flood acceptance may be informed by residents' views of their personal vulnerability.

Declarations of *vulnerability* and *resilience* are both positively related to attitudes towards household responsibility in FRM; indicating that those who consider themselves to be vulnerable and report low coping and recovery self-efficacy, are more likely to accept responsibility for managing the risk to their property. Moreover of the residents sampled, as one might expect, it appears that those who do not regard themselves as vulnerable and feel able to cope, also report that flooding is not a major concern for their household.

With regards to **coping**, it seems that residents with positive views towards their coping abilities, display forms of preventative coping, though contradictorily, show traits for proactive ("*take charge person*") and non-proactive coping ("*let things work out on their own*"). These

traits for coping are particularly interesting, because further correlation testing shows that those with take-charge (proactive) strategies are less likely to feel that the householder should be responsible for managing their property's flood risk. This is contrary to the literature which implies that people with an *internal locus of control* are more likely to accept responsibility and adopt precautionary measures (McClure et al., 1999; 2006). As this sample is not objectively exposed to flooding then one might question whether this observation is futile, but it is one aspect of the constellation of research findings sought in this analysis. Furthermore, it was found that proactive coping is evident in residents who are in good health and do not feel limited by age. This observation suggests that the socio-demographic characteristics typically used to define vulnerability in etic-orientated research, may be connected to individual differences in coping strategies. Interestingly, in the sample not exposed to fluvial flooding, those without contents and buildings insurance reported lower coping self-efficacy than those with insurance and indicate the importance of finances.

Bivariate correlation showed that positive views towards the ability to recover (i.e. 'bounce back to normal'), are positively related to optimism and strategic coping. Furthermore, residents with a high self-belief in their recovery abilities, are less likely to consider themselves to be vulnerable to flooding. Interestingly, significant differences were observed between residents located in different areas of vulnerability and deprivation, according to the SFVI (Tapsell et al., 2002) and the IMD (DCLG, 2008). In this instance, it seems that participants residing in areas of higher vulnerability and deprivation are more likely to feel that they would struggle to recover. These findings were echoed in the analysis of those not exposed to fluvial flooding, as well as the sample as a whole and are interpreted in the next section.

SUMMARY: Sample *not* objectively exposed to pluvial flooding, Bradford

- There is a strong connectivity between residents' declarations of risk, vulnerability and resilience.
- Lower estimates of risk are evident in residents' who do not feel money would be an issue if flooding were to occur. This correlation suggests that finances partially influence subjective perspectives of risk.
- Higher estimates of risk evident in households with members under the age of 18 years (as found in the *flood risk awareness questionnaire*), and potentially indicating the role play by emotions in shaping perspectives of risk.
- The challenge of discerning traits for optimism and pessimism was highlighted in correlation analysis for declared vulnerability, though these traits do appear to be influential.
- Those who consider themselves to be at-risk and vulnerable are more likely to agree that the household should be responsible for managing the risk to their property.
- Coping self-efficacy is positively correlated with *proactive coping*; however, this coping strategy is negatively correlated with attitudes towards household responsibility in FRM. Moreover, proactive coping is positively correlated with health status and age (i.e. those of poor health or limited by their age are less likely to adopt proactive forms of coping).
- Recovery self-efficacy is significant varied between areas of high vulnerability (SFVI) and deprivation (IMD).

5.3.1.3 Results from analysis of the whole sample, Bradford

Contrary to hypothesised, whole sample analysis did not reveal significant differences in declared risk and vulnerability between residents located within or outside the objective boundaries for fluvial or pluvial flooding. As discovered in analysis of the *flood risk awareness questionnaire*, subjective views of flood exposure held by residents in this study site, do not resonate with the objective boundaries of flood hazard (fluvial or pluvial). In the analysis of the *flood risk awareness questionnaire*, this was attributed to the presence of flood defences and the dominance of fluvial flood hazard (rather than potential pluvial causes of flooding). This was also evident here in the analysis of the whole sample (n=27), which revealed significantly higher estimates of risk amongst those unaware of flood defences (where U = 15.00, *sig at 0.05*, n=27). The influence of defences and possible "levee bias" amongst residents in this case study was discussed earlier and holds critical implications. Indeed, impressions of safety and security potentially portrayed by mitigation to a single cause of flooding could have a detrimental effect on awareness and engagement with other flood types (i.e. pluvial flooding).

In addition, it can be noted that residents' views were not significantly varied between socio-demographic characteristics or so-called vulnerable groups. However, declared coping was

positively correlated with residents' reported finances and health; the latter of which was also evident in views concerning the ability to recover. This finding reveals that residents with high coping self-efficacy are less likely to feel that money would be a problem if their property was to flood, or report health issues. Both financial and physical limitations are recurring rationales for vulnerability indicators (discussed in Section 2.5); although these characteristics are not matched in terms of *vulnerability*, there is symmetry between this literature and residents' declarations of resilience observed in this study.

Furthermore, significant differences were observed across residents located in different areas of vulnerability and deprivation. In this instance, declared vulnerability was significantly varied between households located in areas classified as low vulnerability (SFVI 2, Mdn = 2) and average vulnerability (SFVI 3, Mdn = 3); where U = 40.50, *sig at 0.05*, (n=27). Participants located in areas of relatively higher vulnerability according to the SFVI are more likely to declare themselves as vulnerable. Similar trends were observed in residents' views towards recovery ('bounce back'), which was significantly varied between households located in different areas of deprivation; where H (2) = 8.154, p <0.05 (N = 27). In this case it seems that residents located in more deprived areas display lower estimates of recovery self-efficacy. Contrary to the analysis reported in Section 5.2, these findings imply that the SFVI and IMD are good predictors of declared vulnerability and recovery self-efficacy, respectively. Further analysis examined whether this trend is related to the position of these households within the objective boundaries of flood hazard (fluvial and pluvial); however, no significant differences were identified. A number of variables are included within the SFVI and IMD, making it difficult to discern whether this finding is related to the socio-demographic make-up of the area, financial deprivation etc. One potential interpretation is that the *social setting* of area potentially influences personal views of vulnerability and recovery ability, just as existing research has demonstrated the importance of the environmental context upon constructions of risk (Bonaiuto et al., No Date). The influence of *place* was highlighted for further investigation in qualitative data analysis.

Finally, whole sample analysis suggests that those who do not consider themselves to be at risk are less likely to apply strategic planning, but display tendencies towards preventative coping. Preventative coping was also positively correlated with declared vulnerability; i.e. those who do not consider themselves to be vulnerable are more likely to adopt preventative coping strategies. As discussed in the context of the sample exposed to pluvial flooding, this

reveals that residents' declaring themselves as vulnerable may lack this trait of preventative coping, which could in turn, enhance their resilience in the aftermath of flooding.

SUMMARY: Whole sample, Bradford

- Declarations for risk, vulnerability and resilience do not resonate with the objective boundaries of flood hazard exposure (fluvial or pluvial).
- Estimates of risk are higher amongst residents unaware of local (fluvial) flood defences, suggesting that risk is constructed in the context of fluvial flooding. This finding has implications for raising awareness of pluvial flood risk in the area.
- Declarations for *risk* and *vulnerability* are not systematically varied between different socio-demographic groups sampled for this study. However, Analysis showed that residents with high coping self-efficacy are less likely to feel that money would be a problem if their property was to flood, or report health issues. This finding reveals a synergy between objective perspectives where *vulnerability* is related to socio-demographic groups, and subjective (residents') perspectives on *coping*.
- Those located in areas of higher vulnerability (SFVI) and deprivation (IMD) report higher estimates of vulnerability and lower estimates of recovery self-efficacy, respectively. This could reflect a number of underlying variables linked to these composite indices, but could potentially indicate the influence of *place*.
- Preventative coping is positively correlated with residents who do not consider themselves to be at risk or vulnerable to flooding. Amongst those who do consider themselves to be vulnerable, this could be detrimental to anticipatory and reactive coping, and lead to greater distress if a flood was to occur.

5.3.2 FINDINGS FROM THE ISLE OF WIGHT STUDY

The results of bivariate correlations between declarations for risk, vulnerability and resilience are presented in Table 5.8. This analysis reveals positive relationships between residents' views on risk, vulnerability and coping. However, it was not possible to calculate correlations for recovery self-efficacy, as all respondents in this sample responded identically. Further connectivity between these constructions is examined for the sample exposed to pluvial flooding and illustrated in Figure 5.10.

Table 5.8: Correlations between resident declarations of risk, vulnerability and resilience, based on Kendall's Tau correlation coefficient (1 tail): IOW case study. * Significant at 0.05 ** Significant at 0.01.

Declaration	Whole sample (n=13)	Sample exposed to flooding (n=7)
I do not consider myself to be at risk of flooding	I do not consider myself to be vulnerable (.836**)	I do not consider myself to be vulnerable (.915**)
	If my property was to flood I would be able to cope (.484*)	If my property was to flood I would be able to cope (.778*)
I do not consider myself to be vulnerable	I do not consider myself to be at risk of flooding (.836**)	I do not consider myself to be at risk of flooding (.915**)
		If my property was flooded I would be able to cope (.630*)
If my property was to flood I would be able to cope	I do not consider myself to be at risk of flooding (.484*)	I do not consider myself to be at risk of flooding (.778*)
		I do not consider myself to be vulnerable to flooding (.630*)
If my property was flooded I would soon bounce back to normal		*Unable to compute (i.e. responses are identical across participants)*

5.3.2.1 Results from analysis of residents *exposed* to pluvial flooding, IOW

This section reports the findings from quantitative analysis of those objectively identified as being exposed to pluvial flooding[46]. There are a number of shared variables related to **declared risk, vulnerability and coping**. Those who do not consider themselves to be at risk or vulnerable to flooding, but feel that they would be able to cope if a flood occurred, report traits of optimism; agree that flooding is not a major concern for the household; and assert that there are more important things in daily life to be concerned about. Existing research has shown that optimism can dampen threat appraisal and is one interpretation here; though it is also noteworthy that only one participant had experienced flooding in this sample and lack of previous encounters with flooding may also account for this finding. Therefore there is insufficient data from which to unpick this relationship.

Moreover, there is a positive relationship between these three declarations and the attitude '*there's nothing we can do to prevent flooding*'. This variable is indicative of locus of control

[46] A full summary of these results is provided in Appendix A2.4

(see Section 4.5.42) and is correlated with fatalism and non-proactive coping in this sample. However, contrary to hypothesised, those who agree with this statement also agree that the householder should be more responsible at managing potential risk to the property. Bivariate correlation tests for declared risk, vulnerability and coping are also positively related to attitudes towards household responsibility in FRM; therefore, although these residents do not consider themselves to be at risk or vulnerable to flooding, they agree that householders should be partly responsible.

Residents who do not consider themselves to be at-risk or vulnerable, also tended to state that money would not be a problem if a flood were to occur. This finding suggests that finances are important in the formulation of **declared risk**. Interestingly, fatalism is positively correlated with declared risk and coping. As previously discussed, fatalism is represented in the literature as maladaptive and a potential cause of heightened vulnerability. Analysis here, shows a number of related traits for optimism and different coping strategies. Although fatalism is positively correlated with the view that "*there are more important things in daily life to be concerned about*" and "*there's nothing we can do to prevent flooding*"; as mentioned above, this latter view is not related negative attitudes towards risk responsibility and in this study at least, fatalism does not appear to be a point for concern.

Declared vulnerability is significantly correlated with another trait for optimism and also, with an attitude of flood acceptance ("*flooding is just something that happens").* Those adopting this attitude do not employ avoidance coping and also agree that the householder should maintain some responsibility towards their property in terms of flood risk management. Therefore, contrary to hypothesised, attitudes of flood acceptance are not necessarily a barrier to activities for encouraging self-reliance at the household scale.

As hypothesised, residents' views related to coping (i.e. coping self-efficacy) are positively correlated with different coping strategies for strategic and preventative coping, and instrumental support seeking. Furthermore, it appears that low coping self-efficacy is related to whether the individual has dependents to think about and whether they require the help of others to support their daily activities. Thus socio-demographic characteristics are relevant for understanding residents' appraisals of coping.

SUMMARY: Sample exposed to pluvial flooding, IOW

- There is a strong connectivity between residents' declarations of risk, vulnerability and coping
- Low estimates of risk and high estimates towards coping self-efficacy are correlated with optimism, but it is not clear whether this is due to the detrimental effect of optimism (evident in the literature); or due to the lack of flood experience in this sample.
- The view "*there's nothing we can do to prevent flooding*" is indicative of an external locus of control and is evident in those who do not regard themselves as at risk or vulnerable to flooding, and feel that they would be able to cope if a flood occurred. However, those expressing this view also agree that householders should be responsible for managing the risk to their properties: i.e. external local of control is not detrimental to acceptance of risk responsibility.
- There is a positive correlation between declared risk, vulnerability and coping, with attitudes towards household responsibility, suggesting that those who do not consider themselves to be at risk etc., agree that the household should adopt responsibility. Reversely, this implies that those who do consider themselves to be at risk etc., do not agree they should be responsible in FRM.
- Correlations between declared risk and vulnerability with residents' opinions concerning the financial impact of flooding, suggests that finances are influential in shaping these views. This finding reveals a point of synergy between objective and subjective perspectives of risk and vulnerability.
- *Fatalism* is positively correlated with declared risk and coping, and flood acceptance is positively correlated with declared vulnerability; however, neither variable is related to attitudes towards risk responsibility or other variables of potential relevance to FRM; therefore, are not points for concern.
- Lower estimates of coping self-efficacy are evident in residents with dependents and requiring the support of others to support their daily activities. This finding reveals a point of synergy between objective and subjective perspectives of vulnerability and coping, respectively.

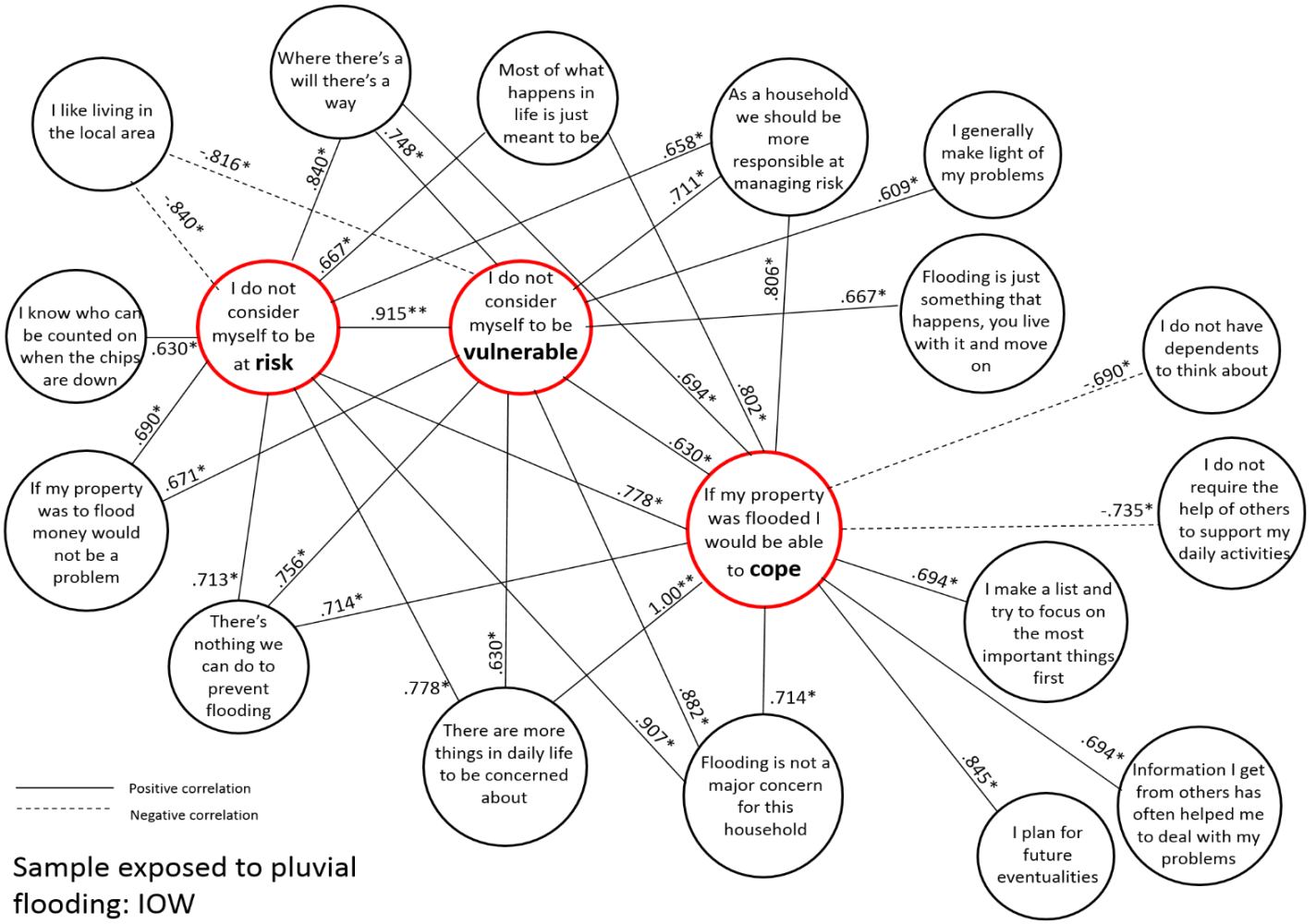


Figure 5.10: Matrix for significant variables emergent from bivariate correlation (Kendall's Tau, 1-tail and 2-tail tests) and non-parametric difference tests (indicated in boxes), obtained from *post-interview questionnaires* with residents objectively identified as <u>exposed</u> to *pluvial* flooding (according to the 1 in 100 year flood modelled by Chen et al., in Allitt et al., 2009): Isle of Wight case study.

5.3.2.2 Results from analysis of the whole sample, IOW

Analysis was also performed on the data as a whole, including those sampled both inside and outside the objective boundaries of flood hazard. A number of significant differences emerged in this analysis and are listed in Table 5.9. Firstly, differences were identified in declared vulnerability, which were highest amongst those who considered themselves to be on the floodplain (n=4). Whilst statistically significant, this finding is based on a very small sample size; nonetheless, it indicates the role played by the hazard in informing views of vulnerability.

Table 5.9: Significant differences identified in whole sample analysis (n=13), IOW case study

Declarations	Significant difference identified
I do not consider myself to be at risk of flooding	Tenure - Kruskall Wallis, *H* (2) = 6.082, *p* <0.05. N = 13. Median scores for owned is 1 (n=7); mortgaged is 3 (n=5); rented (private) is 4 (n=1).
I do not consider myself to be vulnerable to flooding	Awareness of floodplain - Mann Whitney. Significant differences between households who consider themselves to be on the floodplain (Mdn = 3) and those who do not (Mdn = 1); where *U* = 3.500, *sig at 0.05*, r= -0.652 (n=13)
If my property was flooded I would be able to cope	Position in the household - Kruskall Wallis, *H* (2) = 9.046, *p* <0.05. N = 13. Median scores: I live alone is 2 (n=4); I live with a partner, without children is 1 (n=5); I live with a partner, with children is 2 (n=4).
	Property type - Kruskall Wallis, *H* (3) = 9.241, *p* <0.05. N = 13, Median scores: Detached is 1 (n=1); Semi-detached is 1 (n=4); Terrace is 2 (n=5); Bungalow is 2 (n=3).

Secondly, declarations of risk and coping were significantly varied between different socio-demographic groups. Higher estimates of risk were evident in those who rented and mortgaged rather than fully-owned their property. Although statistical difference tests could not be performed, the data suggests that those fully-owning their properties have lived in the area longer. Moreover, as found in the analysis of the *flood risk awareness questionnaire*, length of residency influences subjective views of flood exposure (i.e. estimates decrease over time) and may reflect evidence of the "availability bias" (Tversky and Kahneman, 1974). An alternative interpretation, is that this finding indicates underlying financial concerns. This interpretation was also implicated in the observed differences in coping between different property-types; where participants occupying detached or semi-detached properties displayed higher coping self-efficacy than those in terrace or bungalow properties. Another interpretation of this finding is linked to the household profile. For instance, lower income households may tend to purchase cheaper terrace properties, whilst elderly households

display a tendency towards bungalow accommodation given mobility constraints. In light of this latter trend, and beyond financial concerns, coping may be informed by *physical dependency*.

Furthermore, declared coping was significantly varied between different positions in the household and it was observed that those living alone or living with a partner with children, tended to feel that they would be less able to cope than those who live with a partner without children. This finding demonstrates a synergy between objective and subjective perspectives on vulnerability and coping, respectively and highlights the importance of family structures. Whether this is related to emotional or financial bonds cannot be deduced from this quantitative study alone; therefore this was identified for further examination in qualitative interview analysis.

Finally, significant correlations emerged in the whole IOW sample analysis for different coping strategies. These findings suggest that households who report high recovery self-efficacy, are more likely to exhibit proactive forms of coping, but less likely to seek instrumental support from others. This latter observation is contrary to that observed in residents' reported declarations of coping and implies that instrumental support from others is less relevant to this process of recovery, but more important for appraisals of coping self-efficacy. The flip-side of these findings, is that those who would struggle to recover report a tendency towards non-proactive and avoidant coping. Observations of avoidance coping may be of interest to FRM and strategies for cultivating household resilience (considered further in Section 5.4).

SUMMARY: Whole sample, IOW
▪ Reported vulnerability is higher in residents who believe they are living on the floodplain; thus indicating the influential role of the subjective views of flood hazard, upon declared vulnerability. ▪ Reported risk is higher in residents living in rented or mortgaged properties (rather than owned). This finding might be attributed to underlying financial issues, or perhaps linked to length of residency in the area (as shown in the flood risk awareness questionnaire). ▪ Significant differences were identified in coping self-efficacy between types of properties, indicating that residents in terrace and bungalow properties display lower estimates of their coping abilities. This may be attributed to income (as above), or potentially linked to the characteristics of residents who typically live in this type of accommodation (i.e. bungalows are typically associated with the elderly or those with physical mobility constraints). ▪ Those living alone or with young children report lower estimates of coping self-efficacy. This finding reveals a point of synergy between objective and subjective perspectives of vulnerability and coping, respectively.

5.3.3 KEY DIFFERENCES & SIMILARITIES BETWEEN CASE STUDIES

There are some apparent differences and similarities emergent from this analysis, which make the Bradford and Isle of Wight studies an interesting opportunity for comparison. These differences will be explored further through in-depth qualitative analysis in Chapter 6, but can be summarised as follows;

- ❖ Both studies confirm that the objective boundaries of flood exposure represented in hazard mapping, poorly predict subjective views of exposure, risk and vulnerability. However, these subjective perspectives are influential in declared vulnerability.

- ❖ Section 2.5 of this thesis discussed how vulnerability is often treated as a condition belonging to certain socio-demographic groups. This analysis revealed a number of significant correlations and differences in residents' declarations of risk, vulnerability and resilience related to such groups (summarise in Table 5.10). In the IOW study, variables related to finances, mobility and emotions are identified in the context of risk and coping self-efficacy. Adding to this list, significant differences were identified in the Bradford study between households located in different SFVI or IMD areas.

Table 5.10: Significant correlations and differences identified for resident declarations of risk, vulnerability and resilience linked to so-called 'vulnerable' characteristics

Sample	'Vulnerable' characteristic	Declaration
Exposed to pluvial flooding: Bradford	Finances if property was to flood	Coping self-efficacy
	Households with members under the age of 18 years	Recovery self-efficacy
	Households with members over the age of 75 years	Recovery self-efficacy
	Main income provider is retired	Recovery self-efficacy
Exposed to fluvial flooding: Bradford	Households with members under the age of 18 years	Recovery self-efficacy
	Households with members over the age of 75 years	Recovery self-efficacy
	Main income provider is retired	Recovery self-efficacy
Not exposed to pluvial flooding: Bradford	Households with members under the age of 18 years	Risk
	Finances if property was to flood	Risk
	SFVI	Recovery self-efficacy
	IMD	Recovery self-efficacy
Not exposed to fluvial flooding: Bradford	Households with members under the age of 18 years	Risk
	Contents and building insurance	Coping
	Resident requires the help of others to support daily activities	Coping
	SFVI	Recovery self-efficacy
	IMD	Recovery self-efficacy
Whole sample: Bradford	Finances if property was to flood	Coping self-efficacy
	Health	Coping and recovery self-efficacy
	SFVI	Vulnerability
	IMD	Recovery self-efficacy
Exposed to	Finances if property was to flood	Risk

Sample	'Vulnerable' characteristic	Declaration
pluvial flooding: IOW		
	Resident requires the help of others to support daily activities	Coping self-efficacy
Whole sample: IOW	Tenure	Risk
	Property type (possible linked to household profile)	Coping self-efficacy
	Position in household (households with members under 18 years and residents living alone)	Coping self-efficacy

- Dispositional characteristics emerged as relevant in both locations and the study of the population exposed to pluvial flooding. Optimism, external locus of control and fatalism were reported in the context of declared risk and coping, and acceptance of flooding observed as relevant to declared vulnerability, in the IOW sample. Optimism and pessimism emerged as significant in declared risk and vulnerability in Bradford.

- Whereas residents' declarations of risk, vulnerability and coping are correlated in the IOW, declared risk and vulnerability are noticeably divorced from coping/recovery self-efficacy in Bradford. Whether this reflects limitations in sample size, the wording of the questionnaire or suggests that constructs of self-efficacy are unimportant to appraisals of risk/vulnerability in Bradford, is identified for in-depth study (Chapter 6).

- Significant differences are reported in declared risk between those aware or unaware of fluvial flood defences; again, highlighting the influential role these play in the Bradford study. The context of 'defended-place', raises implications for the communication of pluvial flood risk.

- Although quantitative data analysis was limited in the IOW study due to low participation, this is an important finding itself (discussed in Section 5.2.1.3).

5.4 CONCLUSIONS & IMPLICATIONS

This analysis has provided quantitative insight into the variables influencing self-declared vulnerabilities and considered the possible implications of these findings in terms of residents' attitudes towards embracing household responsibility in FRM (RQ1). Both studies confirm existing research highlighting a disparity between objective and subjective perspectives of flood exposure (e.g. Burningham et al., 2008). Although objective boundaries of flood hazard are shown to poorly predict patterns of declared vulnerability, the hazard itself is not unimportant. Indeed, highly significant correlations were reported between declared risk and vulnerability, and the hazard discussed in qualitative responses to the flood risk awareness questionnaire; thus, it is the subjective perspective of flooding that is of importance.

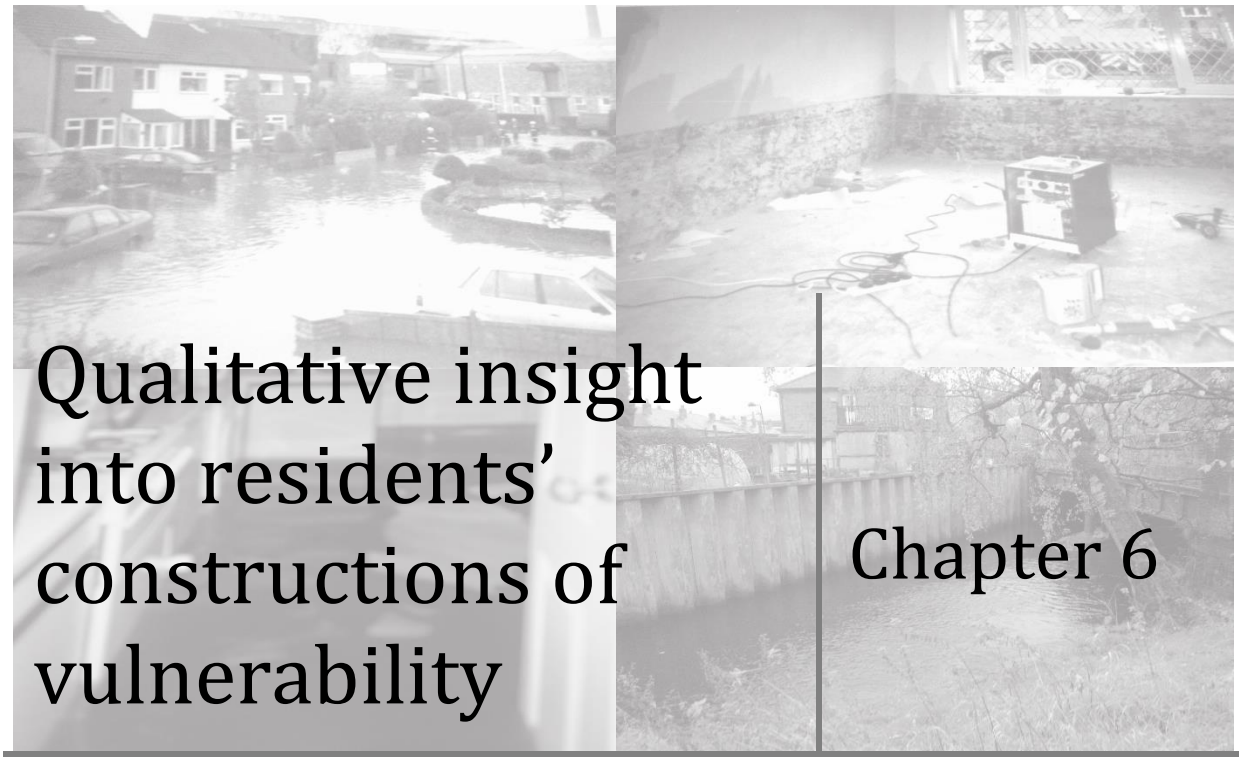
Whilst research and policy recommendations have emphasised the importance of moving away from assessments of vulnerability in socio-demographic terms (Twigger-Ross and Scrase, 2006), this study shows certain characteristics to be relevant (Table 5.10). Significant differences were observed in self-efficacy between households with elderly members, child dependents, financial differences and health/mobility status. Furthermore, the Index of Multiple Deprivation and Social Flood Vulnerability Index emerged as good predictors of recovery self-efficacy and declared vulnerability in the Bradford study. Given the make-up of these indices it is difficult to discern why this may be the case, whether it reflects a specific indicator (e.g. financial deprivation of the area) or the influence of 'place' in general, and is highlighted for further examination.

Also documented is the role of dispositional characteristics. It is argued in the literature, that the degree to which an individual has partaken in proactive coping, will affect the effectiveness of anticipatory and reactive coping in the face of a specific threat and the potential distress experienced (e.g. Aspinwall and MacNamara, 2005; Greenglass and Fiksenbaum, 2009). This analysis reveals mixed evidence for the role played by different coping strategies in shaping residents' appraisals of personal risk and vulnerability, as well as views towards flooding more generally. This partly reflects the small sample sizes and adaptation of the Proactive Coping Inventory (Greenglass and Fiksenbaum, 2009). Whilst it was not the original intention to conclusively demonstrate this, this study has provided a useful starting point for directing future research in the field. In addition and despite somewhat contradictory findings concerning the influence of other dispositional characteristics (e.g. optimism-pessimism), it is

clear that such individual differences are relevant and warrant further research. These findings may be helpful for tailoring communication strategies in FRM (unpicked further in Chapter 9).

Favourable attitudes towards risk responsibility were expressed by those who consider themselves to be at-risk and vulnerable to flooding in Bradford. This raises implications for fostering ownership of risk amongst those who not conceive flooding to be relevant to them (yet objectively identified as at-risk). In contrast, analysis of questionnaires obtained in the IOW study, revealed favourable attitudes amongst those who do *not* consider themselves to be at risk. Importantly it must be acknowledged that favourable attitudes do not necessarily result in the uptake of precautionary behaviours. In the Bradford study, it seems that fluvial flood defences support a "levee bias" (discussed in Haynes et al., 2008) and has significant implications for raising awareness of pluvial flooding in the area.

There are a number of limitations to this approach that must be acknowledged. Firstly, it is acknowledged that the elicited views of residents sampled for this study may be informed by different underlying constructions of the concepts presented in the questionnaire. Secondly, an assumption of the questionnaire method is that language is interpreted in the same way, but as research has shown, this is an inherently flawed assumption. In the *post-interview questionnaire* for example, analysis revealed very strong, positive correlations between responses to declared risk and vulnerability, raising the concern that the two may have been interpreted as synonymous. There is a semantic tension to acknowledge. Indeed, "*I do not consider myself to be vulnerable to flooding*" could have incited hazard-orientated responses and may have prompted different responses if the terms "*to flooding*" had been omitted. In contrast, questionnaire items for 'coping' and 'bounce back to normal' are more explicitly orientated towards the impact of flooding (rather than the possibility of flood occurrence). Unless constructed from in-depth or cognitive interviews, the language included (or omitted) from questionnaires ultimately represents what Berry would describe as an '*imposed etic*' (Section 2.4.1). Although quantitative analysis has contributed valuable insights in its own right, this thesis now turns to the qualitative phase of this study. Certain points raised in this chapter will be 'followed' in this coming chapter to build up a constellation of research findings.



Qualitative insight into residents' constructions of vulnerability

Chapter 6

CONTENTS

6.1 INTRODUCTION

This chapter reports on the qualitative analysis of in-depth interviews and vignette-elicited discussions with residents in the Bradford and Isle of Wight (IOW) case studies (as outlined in Chapter 4). This analysis is based on the samples described in Section 5.3 and steered by the following research questions;

> **RQ1**:- How is vulnerability constructed and experienced by residents in locations at risk of flooding? What are the variables influencing self-declared vulnerabilities? What are the implications of self-declared vulnerabilities?
>
> **RQ3**:- Is it possible to infer degrees of "insiderness" and define insider-outsider boundaries amongst research participants? To what degree does *insiderness* influence constructions of vulnerability and declarations of vulnerability? Can these be aligned to the etic-emic spectrum?

For the purpose of this thesis, '***self-declared vulnerabilities'*** are defined as the participant's view of his or her degree of vulnerability towards flooding; where the individual may consider themselves to be either vulnerable, not vulnerable or somewhere in between. Whilst the previous chapter examined these views as elicited through quantitative analysis, this chapter aims to unpick the underlying variables and processes shaping the *construction* of these views, through the application of grounded theory methods outlined in Section 4.5.3. In turn, implications for FRM are examined. Following the example set in Chapter 5, a clear distinction is made between the residents objectively identified as *exposed* to flooding (on the basis of scientific modelling; Section 4.4.2); and those *not exposed* to flooding[47].

The chapter begins by briefly outlining the different constructions that emerged from the analysis of discussions with residents in the selected study sites. From this analysis, a number of variables and processes are identified which appear to be influential and important for understanding the nature of residents' constructions of flood vulnerability, and these are examined in turn through Sections 6.3 to 6.5. At each stage, the implications of research findings are considered and attention given to the relationship between self-declared vulnerabilities and participants' beliefs in their ability to respond and cope with flooding; as well as their willingness and motivation to accept responsibility for managing flood risk.

[47] Note that "objective exposure" to flooding is distinguished from "subjective exposure to flooding"; whereas the former is based on scientific numerical modelling, the latter refers to the subjective views/constructions of exposure expressed by the residents interviewed for this study.

In Chapter 2, the need to critically and analytically reflect upon participants' degrees of "insiderness" was emphasised and identified as an under-researched theme. This is addressed through the third research question of this thesis and examined in Section 6.6. Different axes for examining *insiderness* are considered and the challenges and opportunities for distinguishing insider-outsider boundaries are evaluated. Critically, this section investigates the extent to which *insiderness* appears to influence constructions and declarations of vulnerability, and whether these may be conceptually aligned to the etic-emic spectrum presented in Chapter 2. Finally, this chapter concludes with recommendations for future research and potential strategies for enhancing resilience at household scales.

6.2 CONSTRUCTIONS OF VULNERABILITY

Residents' constructions and views related to flood vulnerability were elicited through direct questions about whether they *currently* consider themselves to be vulnerable to flooding. Additional questions asked participants to consider their personal vulnerability towards a hypothetical flood event (i.e. if a flood was to occur), and the vulnerability of others (see Section 4.5.1). Table 6.1 records the different views on personal flood vulnerability emergent from resident interviews and the number of participants exhibiting these views. It was apparent in the analysis of these interviews, that these views are informed by different underlying constructions of vulnerability (Table 6.2). Moreover, these are not mutually exclusive, as some participants exhibited more than one type of construction. In broad terms, these constructions are described according to the following categories:

I. **Hazard-centric vulnerability -** Vulnerability is understood in the context of flood hazard, in terms of probability and/or magnitude of flooding (Box 6.1).

II. **Social-centric vulnerability** - Certain members of society, with specific characteristics, are more susceptible to adverse consequences of flooding and are less able to adequately respond and recover (Box 6.2).

III. **Existential vulnerability –** Vulnerability is related to the human state and articulated in terms of emotions, i.e. to feel vulnerable and exist in a state of vulnerability (Box 6.3).

Comparing "present" and "future" views on vulnerability

From these interviews it was evident that the majority of participants responded to questions on vulnerability in futuristic terms (i.e. *if a flood were to occur*); although this reflects the questioning, it was also observed in cases where the participant was encouraged to answer in

the 'present' tense. Therefore, the distinction "present" and "future" vulnerability in Table 6.2, is somewhat illusionary. However, there were a few cases where present and hypothetical views on personal vulnerability clashed and these were observed in the Bradford study. In this case, one flood experienced household did not consider themselves to be vulnerable in the present tense, but strongly believed that they would be vulnerable if flooding was to occur again; interestingly, both views on self-vulnerability were based on social-centric and existential constructions. In contrast, an inexperienced (not exposed) household displayed hazard-centric constructions when vulnerability was questioned in the present tense, and social centric constructions in the futuristic tense. In this instance, views on self-vulnerability shifted from 'not vulnerable' to 'certainly vulnerable'. Two other participants also displayed a similar switch from hazard to social centric constructions between the present and future tense, though this did not result in a change in views on self-vulnerability.

These observations indicate a potential pattern whereby vulnerability is constructed in hazard-centric terms in the present; whereas hypothetical, future-orientated discussions seem to prompt more self-awareness. As observed in Chapter 5, it is difficult to elicit current views on vulnerability without orientating discussions towards the potential threat (i.e. vulnerable to what?). However, the sequence of wording, "*vulnerable to flooding*", may prompt participants to respond in terms of likelihood, as is seen here. Indeed, existing research has emphasised the importance of a 'perceived trigger' to prompt appraisals of personal vulnerability and coping capacity (Grothman and Reusswig, 2006). However, hazard-centric constructions of vulnerability were observed in this research, in response to other questions in the interview process, as well as alongside discussions relating to social and existential expressions of vulnerability. This seems to suggest that evidence for hazard-centrism is not merely a reflection of question wording, but relevant to understanding certain residents' constructions of vulnerability.

Table 6.1: Residents' views on personal flood vulnerability observed in Bradford and IOW case studies

Self-declared vulnerabilities	Bradford case study (n)		IOW case study (n)	
	Present (n=27)	Future flood (n=26)	Present (n=13)	Future flood (n=13)
Not vulnerable - Participant holds the view that they are not vulnerable to flooding	10	8	6	6
Uncertain of personal vulnerability - Participant holds the view that they are potentially vulnerable to flooding	10	10	6	7
Certain of personal vulnerability - Participant is certain of their vulnerability to flooding	7	8	1	0

Table 6.2: Constructions of vulnerability in terms of *self and others*, observed in Bradford and IOW town case studies

Type of construction	Description	Bradford case study (n)	IOW case study (n)
Hazard-centric	Vulnerability is understood in the context of flood hazard, in terms of probability and/or extent of flooding and flood damages.	10	5
Social-centric	Certain members of society are more susceptible to adverse consequences of flooding and are less able to adequately respond and recover.	27	13
Existential	Vulnerability is related to the human state and articulated in terms of emotions (i.e. to feel vulnerable).	5	3

* Categories are not mutually exclusive
* Counts are based on explicit and implicit examples

Hazard-centric constructions of vulnerability

Hazard-centric constructions of vulnerability were observed in ten participants in the Bradford study and five participants in the IOW study. It is noteworthy that the other types of constructions were described in the context of flood occurrence (i.e. if a flood were to occur) and therefore dependent on the hazard to some extent, but are not included in this category. Evident in these discussions, is the synergy between these constructions of *vulnerability* and those of *risk*, as both are defined and evaluated in the context of flood hazard. In these instances, self-declared vulnerabilities are dependent upon the flood (likelihood and/or magnitude) (Box 6.1). The variables and processes shaping these hazard-centric constructions, and spatially grounding constructions of vulnerability in-place, are analysed in depth in Section 6.3.

BOX 6.1: Hazard-centric constructions of vulnerability

Examples from Bradford case study (n = 11):

> "I would be vulnerable in the sense of the water going underneath… it's just the airbricks that are the biggest problem because you could easily block the gate up, you know, sandbag the gate and the rest of it and you've got a wall there, and you've got the steps at the front, so you would be vulnerable to a certain extent, yes, but not … I mean even as bad as it was last time, in here didn't get affected and the hallway and that, it just came up just above the step that allowed that little bit of leeway there. So yes, a little bit" [Int 12, flood experienced; Bradford].

> "Oh yes, yes, I mean you've only got to … after a spell of heavy rain, you've only got to look at the rivers and see how close it is to the top, you know, for it coming over the top, you know what I mean, to flood. You've only got to look at it and you realise just how vulnerable you are" [Int 32, exposed to flooding; Bradford]

> "I don't think we are vulnerable to flooding, it depends how much rain comes down" [Int 27, not exposed to flooding; Bradford]

Examples from IOW case study (n=5):

> **Interviewer**: In what ways do you think you could be vulnerable to flooding?
> **Participant**: Just that back hill…which is probably really silly because there's a road and then there's a house and then there's a garden, and then there's my garden, but ... then their garden slopes and my garden slopes… It goes into gardens of both sides so my whole thing is there's probably be enough of a take away [slightly inaudible] with the gardens in front and this side but I don't know.
> [Int 47, not exposed to flooding; IOW]

> **Participant**: [Response to questionnaire on risk] strongly disagree… I suppose being so low down here I strongly disagree… [On vulnerability] Strongly disagree…what was the last question?
> **Interviewer**: [clarifies] do you think there's a difference between the two?
> **Participant**: Not really. Much the same yeah. [Int 41, exposed to flooding; IOW]

> "Everybody's vulnerable if it floods aren't they?" [Int 38, exposed to flooding; IOW]

Social-centric constructions of vulnerability

Social-centric constructions were identified in this analysis on the basis of socially-centred characteristics, used by participants to identify either themselves or others as potentially vulnerable. For example, analysis revealed that flood experienced participants drew from their experience in both their constructions of vulnerability and resilience; for example, one participant remarked "*for all we've been through it, to go through it again I think it would have more effect on us"* [Int 6, flood experience household: Bradford]. Moreover, some participants identified those with no previous flood experience as vulnerable; "*you could say people who*

haven't…I mean some of these are in rented accommodation, they haven't been through it" [Int 12, flood experienced household, Bradford]. This characteristic was not included in the coding of hazard-centric constructions which focused on the physical characteristics of flooding, only. Instead, "previous experience" was coded as a social-centric construction, given that it was used by some participants as an identifying characteristic of a potentially vulnerable group (or even themselves).

Social-centric constructions of vulnerability essentially seem to mirror the academic debate outlined in Chapter 2, which argues that certain groups in society are more susceptible to the adverse consequences of hazard occurrence (e.g. Cutter et al., 2003; Wisner et al., 2004). Certain characteristics such as age and constraints to physical mobility were discussed in all interviews, including prompted and unprompted discussions (Box 6.2). Overall, the elderly and especially the elderly living alone dominated most discussions, but were also accompanied by other variables such as families with young children (particularly single parent families); those with a disability or illness limiting mobility; those unaware of flood risk and with no previous experience of flooding; and those lacking social networks.

BOX 6.2: Social-centric constructions of vulnerability

Examples from Bradford case study (n = 27):

> "…because we've no insurance or anything like that, we can't afford it, so if we lose anything we've just got to replace it, we've no insurance to cover it, very vulnerable, yes" [Int 32, secondary witness; Bradford]
>
> "…Vulnerable people, like ill or old or young children, and obviously people who do need financial help or even emotional help, if someone doesn't have anyone around or able to help them, or they're not good at coping on their own." [Int 16, secondary witness; Bradford]

Examples from IOW case study (n=13):

> "Well anybody would struggle actually, but there are people in society who are more vulnerable than others, I suppose elderly people and people with young children in particular, but I don't know anybody who wouldn't struggle with a flood actually, it would be awful …" [Int 38, exposed to flooding; IOW]
>
> "Well like anything I suppose, people will have differing levels of capability for dealing with these things won't they? The Isle of Wight of course has quite an elderly population which would be particularly problematic, you know, for an elderly person, and people's financial resources to deal with things vary dramatically don't they? [Int 40, exposed to flooding; IOW]

Existential constructions of vulnerability

A final type of construction presented by the residents interviewed, seemed to describe the emotive *state of being* vulnerable. Interview analysis showed that this construction emerged in discussions about the physical characteristics related to flood hazard, as well as discussions concerning certain socio-demographic characteristics. Vulnerability in these cases, seems to be rooted in feelings of insecurity and related to emotions of worry, fear and loss. This is defined here as an ***existential construction of vulnerability***. Box 6.3 shows how these participants describe themselves and/or others within these existential terms, showing how existential vulnerability may be transferred onto other people. Whilst this was exhibited by a select number of residents in both studies in the context of vulnerability, it is noteworthy that certain socio-demographic or flood-related characteristics were more broadly attributed to existential qualities; these are described in this analysis as evidence of *existential securities* and *insecurities*. These findings are examined further in Sections 6.3 and 6.4.

BOX 6.3: Existential constructions of vulnerability

Examples from Bradford case study (n = 5):

> "But before this happened we didn't feel vulnerable …the houses that were boarded onto the river often had water in the garden. They often had but it was never a thing, you just think oh heavens above their gardens are flooded again, it was never a feeling that kept you awake at night because you just didn't think it was going to happen to you" [Int 4, flood experienced; Bradford].

> "And perhaps people on their own, whether it's elderly or young. You can get the young ones that worry just as much or more than elderly people … And if it's a mum with children, a one parent family she might feel that she's nobody, she's on her own" [Int 6, flood experienced; Bradford]

> "Well she's feeling scared, feeling frightened, vulnerable. [Talking about vignette character] she'll be afraid because she's responsible for two little children and her first concern will be to see what's happening outside" [Int 10, flood experienced; Bradford]

Examples from IOW case study (n = 3):

> Interviewer: How do you think they might be feeling at that point in time?
> Participant: Yes, a bit vulnerable really, the back garden's flooding, a pool of water's collected in the back yard, yes, I'd be feeling a little bit vulnerable I think if that was me now. [Int 34, flood experienced; IOW]

> I would say the over 75s are particularly vulnerable, and I think also couples who are married or together with young children or babies, because again they're in the same emotional situation as the over-75s in a way, they're in a particularly vulnerable situation … I think that kind of emotional trauma, and how do you start? You may have thrown all your money into your home, this might be your first home, you've thrown all your money into it, all your belongings, everything gone, where do you start, you know? … Certainly aged between 25 and 35 emotionally you won't cope with it as well as if you're 45. I don't know why, but I just think you won't, I think you'll be like the over-75s, it can push you into a depression or make you ill or cause other complications or problems, even marital breakdown, because of the stress and the pressure that this sudden loss has put you into. [Int 45, not exposed to flooding;

Whilst these constructions have been presented in isolation, analysis of these interviews showed that they are not necessarily mutually exclusive. For instance, it was observed that some participants displayed both social and hazard-centric constructions, which in one case resulted in different views on self-vulnerability (Interviewee 23, Bradford). Moreover, *all three types* of constructions were evident in four flood-experienced households in the Bradford and IOW studies. Figure 6.1 conceptualises this connectivity between these 3 types of constructions of vulnerability.

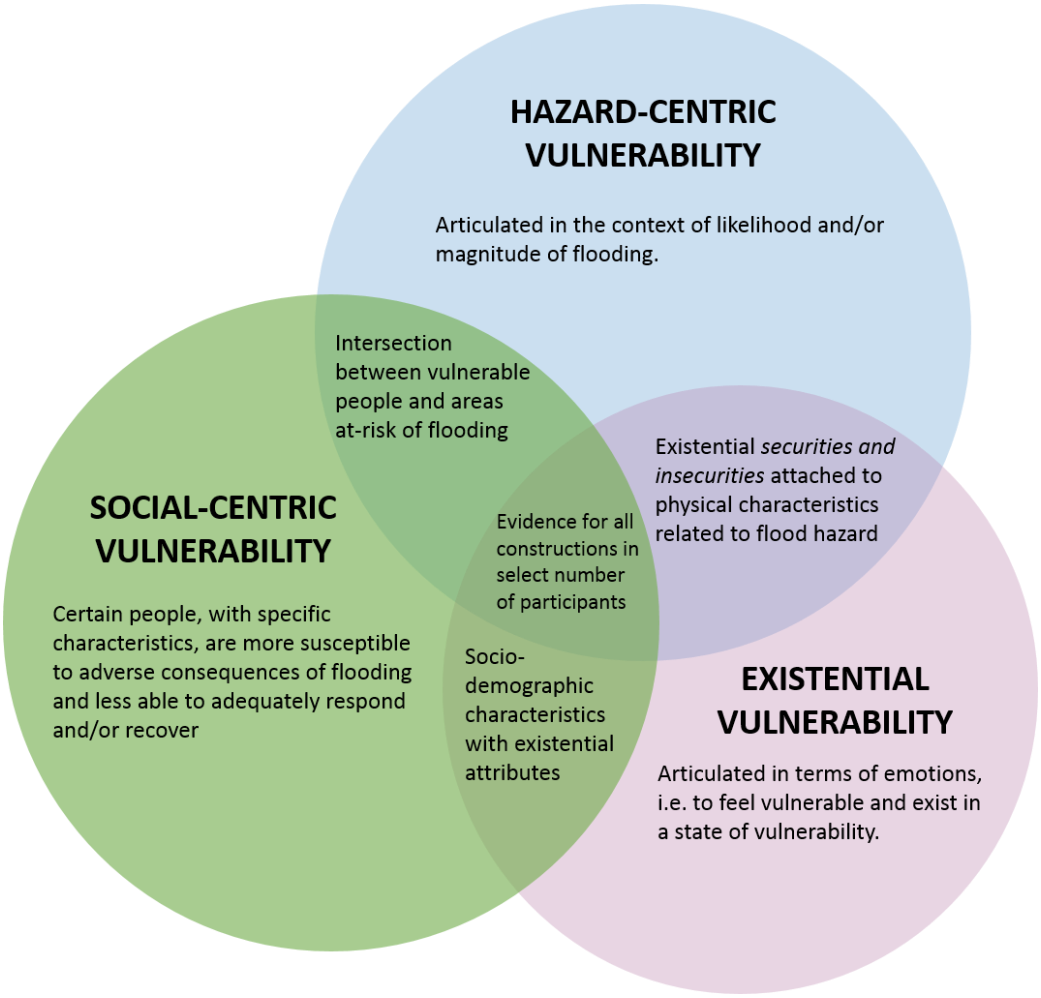


Figure 6.1: Venn diagram to illustrate connectivity between hazard-centric, social-centric and existential constructions of flood vulnerability. Based on residents' articulations of personal vulnerability and the vulnerability of others; observed in the Bradford and Isle of Wight case studies

This discussion has thus far described what types of constructions emerged from the interview analysis, however it is also important to examine how these constructions may result in different views on self-vulnerability. In light of the fact that vulnerability is predominantly constructed in futuristic terms (i.e. if a flood were to occur), Figure 6.2 illustrates the connection between the different types of constructions evident in both study sites and resulting declarations of vulnerability; based on the responses elicited from hypothetical flood questions. Tentative patterns can be identified at this stage. In the Bradford study, it seems that there is no discernible pattern between social-centric constructions and self-declared vulnerability; however, participants exhibiting hazard-centric and existential constructions are more likely to feel certain or unsure about their personal vulnerability to flooding. In contrast, the IOW study suggests that participants with hazard-centric constructions dominantly feel *uncertain* about their personal vulnerability. Similarly to the Bradford study, there is no

apparent pattern in residents' declared vulnerability and social centric-constructions; i.e. participants displaying this type of constructions are not more or less likely to consider themselves to be potentially vulnerable. This observation is also applicable to existential constructions of vulnerability. These patterns are explored and interpreted further in later sections of this chapter. However, analyses now turns to the physical characteristics of flood hazard and examines the ways in which these appear to interact with the three types of constructions described here.

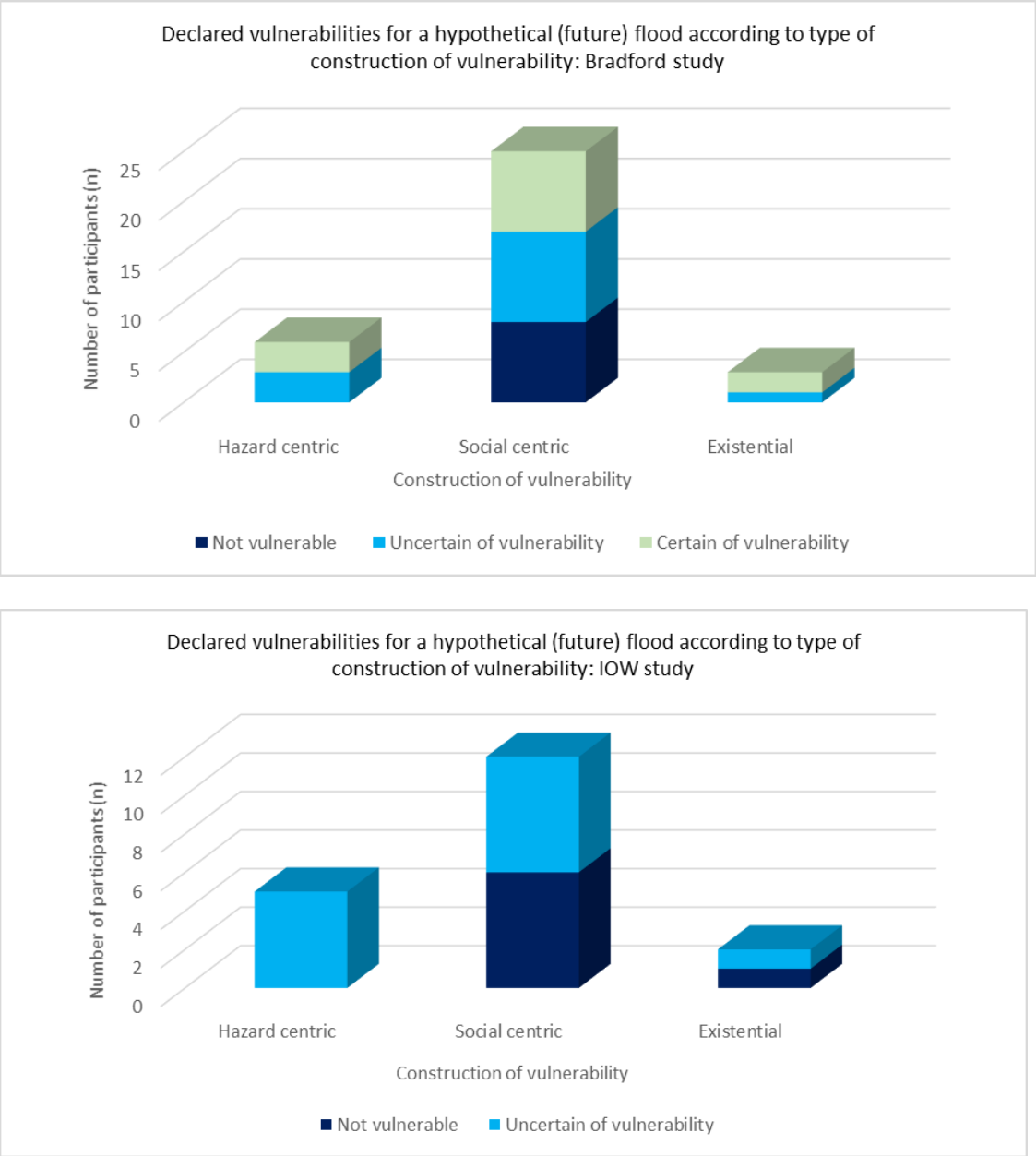


Figure 6.2: Graphs to illustrate declared vulnerabilities towards a hypothetical (future) flood and associated construction(s) of vulnerability evident in participant's interview; based on interviews conducted in Bradford (top) and Isle of Wight (bottom)

6.3 VISUAL MARKERS & CHARACTERISTICS OF FLOOD HAZARD INFLUENCING CONSTRUCTIONS OF VULNERABILITY

In response to questions on vulnerability, certain residents orientated their answers towards the likelihood and magnitude of flooding and qualified their personal vulnerability, or the vulnerability of others, in relation to this. These hazard-centric constructions of vulnerability emerged in a select number of participants in Bradford (n=10) and the Isle of Wight studies (n=5). On the basis of interview analysis, a number of hazard-related characteristics and processes appeared to shape constructions of hazard-centric vulnerability and risk more broadly, as well as inform declarations of vulnerability. This included certain visual markers on the landscape and characteristics related to *flood etiology*; namely frequency, duration, depth and causality.

Further analysis also demonstrated that for some residents, visual markers and certain hazard characteristics held existential qualities, or were interlinked with social-centric constructions of vulnerability (Figure 6.1). Therefore, this analysis also examines the influence upon existential and social-centric constructions of vulnerability and corresponding self-declared vulnerabilities.

6.3.1 VISUAL MARKERS THAT SHAPE CONSTRUCTIONS OF VULNERABILITY

It was apparent from certain interviews that some residents gauge vulnerability according to spatial distances; either from the viewed cause of flooding, previous flood extents or intervening features on the landscape believed to influence the possibility of flooding. These spatial distances were often articulated by participants through visual reference points on the landscape, which in turn seemed to inform self-declared vulnerabilities. An interesting observation from this analysis, was that these *visual markers* seemed to hold unique meanings for certain residents; such that the same visual marker heightened views of personal vulnerability in some, whilst lessening or confirming in others the view that they are not vulnerable to flooding (in a hazard-centric sense).

Gauging distances from visual markers

Firstly, distance was gauged in relation to the viewed cause of flooding in the area. Whilst in Bradford, this predominantly related to the river (and fluvial flooding); in the Isle of Wight

(IOW) study, attention was directed towards the topographic lows of the town and particularly concentrated on the main high street (and the interaction between pluvial and tidal flooding). Whilst this was frequently noted in the responses of the residents sampled in terms of their constructions for *risk*, only one participant described his personal *vulnerability* in this context.

> Everything is uphill from here, and you think, ummm, you know, but it didn't happen on that time, so where the shops are and that, it must be slightly lower I would think. [Int 41, exposed to pluvial flooding; IOW]

This quote indicates how the resident's view of the local topography and his experience as a primary witness to a previous flood event in the area, interact and inform the view that he is vulnerable to flooding. In this case, there is a synergy between the resident's hazard-centric construction of vulnerability and the objective construction of hazard exposure depicted through scientific modelling (Allitt et al., 2009). However, it can also be observed from this example, how visual markers and previous experience can serve to *distance* flooding away from the self, onto other peoples and places. Indeed in this case, it is implied that the properties located 'lower' down are more vulnerable than the participant. Another participant in the IOW study, also articulated her vulnerability in terms of the local topography and the likelihood of flooding (see Int 47 in Box 1). Previously witnessing pluvial flooding in the neighbouring street seemed to shape this perspective, though once again, a degree of spatial distancing was observed within this discussion and a number of intervening features listed by the participant (i.e. the road, houses and gardens). Interestingly, this participant's belief that she may be at-risk and vulnerable to flooding, is at odds with the objective classification, which states that this property is not exposed to flood hazard. Both of these examples highlight how visual markers can be informed through previous flood experiences. Interestingly, the topographic markers used by these participants seem to affirm these participants' views that they are vulnerable; whilst simultaneously acting as a buffer to minimise views regarding the likelihood and severity of flooding.

Similar findings were observed in the Bradford study. Here, hazard-centric constructions of vulnerability were mainly constructed within the context of *fluvial* flooding; thus the rivers in the area were widely referenced in these discussions. Participants who described their *proximity* to the river, were either certain or uncertain of their personal vulnerability (n=7). Whereas two participants, who emphasised their distance from the river and discussed a number of intervening features between their property and the river, did not consider

themselves to be vulnerable to flooding. This latter observation was more widely evidenced in residents' constructions of flood risk and interestingly included three participants located within objective boundaries for pluvial flooding; thus demonstrating a disparity between objective and subjective views of flood exposure.

An interesting observation from these interviews, is that some of those articulating hazard-centric constructions of vulnerability in relation to their proximity to the river, also revealed that the river was not always viewed as the source of a potential hazard. Interestingly, this included two participants who were aware of previous flooding in 1947 when purchasing the property. Instead, the river seems to have become *attached* to connotations of flooding and identified as a visual marker following the 2000 flood event. This process of attachment was further evident in residents' constructions of risk and was visible amongst the majority of flood experienced residents (n = 8), and primary (n = 4) and secondary (n = 3) witnesses to fluvial flooding in the area.

Existential insecurities attached to visual markers

While examining this theme of attachment, it soon became clear that certain visual markers are ascribed with existential meaning. Specifically, heavy rainfall and the rise and fall of river levels prompted ***existential insecurities*** in several interviewees. For instance, in the quote selected below, the participant reflects upon her feelings pre-and-post flooding; where frequent and minor flooding was once conceived as a nuisance, it is now regarded as a feeling that keeps her awake at night. The same participant went on to describe how their experience has heightened their attention towards heavy rainfall and the river level, which was a pattern displayed by the majority of flood experienced participants in this sample. This was also noticeable in the IOW study and articulated by the two residents that had experienced pluvial flooding in their properties (see second quote below).

> "But before this happened we didn't feel vulnerable ……the houses that were boarded onto the river often had water in the garden. They often had but it was never a thing, you just think oh heavens above their gardens are flooded again, it was never a feeling that kept you awake at night because you just didn't think it was going to happen to you" [Int 4, flood experienced; Bradford].

> "I can't say I don't get nervous because when it's really pouring, of course, you can hear it going down and I always have a sense when you can hear it going underneath, we may not be able to at all, but you feel that you can, and so it does make me a bit nervous" [Int 38, flood experienced; IOW]

In these cases, heavy rainfall clearly triggers anxiety and feelings of insecurity; "*every time it rained and still now, every time it rains you think oh not again*" [Int 4, flood experienced; Bradford]. Although heavy rainfall evokes these feelings, as the next section will demonstrate, frequent events resulting in no apparent flooding actually lessen views of risk and hazard-centric vulnerability in the long-term. Despite this, these participants continue to describe feelings of anxiety during periods of heavy rainfall. From this it could be argued that rainfall does not simply signify the potential to be flooded, but serves as a reminder of often painful, past flood experiences. Moreover, although this seems to heighten feelings of vulnerability, both in a hazard-centric and existential sense, this appears to be temporary (i.e. within the temporal boundaries of the storm event).

Detachment from visual markers

In contrast to attachment, the reverse process of *detachment* was also observed. With the fluvial flood defences in place, and the fact that there has been no recurrence of flooding since, a *symbolic shift* seems to have occurred in some residents, whereby the river is no longer associated with connotations of flooding. Analysis of participant interviews in Bradford, showed that the majority of residents felt that the likelihood of flooding had been greatly reduced and some no longer considered the river to be a source of risk (n=8); instead, the area is believed to be *risk free.* This view was mainly expressed by those who experienced the 2000 flood event directly and one primary witness (see quotes below). This finding supports existing knowledge of the "levee bias" and how faith in so-called solutions can lead to *risk transference* (e.g. Haynes et al., 2008: Section 2.3.2.2). However, this finding is at-odds with the scientific assessment for this area; indeed, Chapter 3 described the complex nature of the fluvial defence system, which exacerbates the likelihood of pluvial flooding in this location (Section 3.4.1).

> "if I was going over the river bridge and I looked and thought oh the river's high and that, but I don't now because the defences are up there, there's a massive big defence system they've put in, so I can't say I really worry a lot about it" [Int 10, flood experienced; Bradford]

> "We've been lucky that we've been able to more or less make it so that there's very little chance of it flooding again. Now there's places where they aren't so lucky, they're really close to the rivers but you can't do anything with a bank if it's a low bank really" [Int 12, flood experienced; Bradford]

As illustrated in these examples, visual markers seem to be used by some residents to *distance* or *remove* flood vulnerability from themselves. In these cases, a number of intervening features on the landscape were described, such as the presence of defences, the local topography and fields (located between the river and the property). It is noteworthy that this was observed in participants who had experienced or primarily witnessed flooding in the past. In this context, visual markers seem to be attached to ***existential securities*** and instil impressions of *relative* safety from flooding as these residents compare themselves to other people.

Comparative vulnerability: Notions of the "vulnerable other"

The observation that some residents appear to appraise their personal vulnerability in relation to other people, is referred to here, as the "**vulnerable other**". Implicit in some interviews, is how the 'vulnerable other' is *spatially* identified and used to *distance* or remove ("*other*") flood vulnerability from the self. In effect, estimates of personal vulnerability appear to be lessened in those who display *distancing* (n=6 Bradford, n=2 IOW), whilst those who *other* do not considered themselves to be vulnerable (n=1 Bradford, n=1 IOW). These findings indicate that vulnerability can be thought of as ***spatially othered***. On one hand, it might be argued that this finding reflects the "optimistic bias", shown to lead people to under-estimate risk in the context of others (Weinstein, 1983; McIvor and Paton, 2007). However, another important observation in this study, is that the evidence for existential attachments to visual markers (i.e. securities and insecurities) dominantly occurs in this group of residents. Therefore it might be argue that this process for *spatial othering* is driven by existential reasoning (this is returned to in Section 6.5).

Further evidence for this process is provided more broadly in both case studies, in the examination of participants' constructions for risk and is particularly evident amongst those objectively identified as exposed to flooding. In the Bradford sample, this predominantly occurs within the accounts obtained from flood-experienced participants and seems to manifest in both the distancing and removal of flood risk; i.e. estimates of risk are reduced or risk is deemed non-existent, respectively (see quotes below). In contrast, visual markers mainly

support the removal of risk amongst primary witnesses to flooding on the Isle of Wight; thus flooding is conceived as an issue for other people and locations.

> "Further up the river since then they have been flooded, down the river they have been flooded, but because we have had the [defences]…it's gone further on and left us" [Int 3, flood experienced; Bradford]

> "I do, but not as high risk as others who haven't obviously got the barrier, because if you look at the other side, I can't even remember seeing one at the other side to protect the other side of the road … I don't think there's a barrier to protect that side, so I think they're more at risk than us" [Int 21, secondary witness, not objectively exposed to flooding; Bradford]

Interaction between hazard-centric and social-centric constructions of vulnerability

To this point, this section has largely focused on the hazard-centric constructions of vulnerability and described existential discussions linked to certain visual markers. However, amongst certain residents, the interaction between *hazard-centric* and *social-centric* constructions of vulnerability was also explicitly evident. In the Bradford study, several participants articulated vulnerability in terms of the location of vulnerable people within areas liable to flooding; i.e. vulnerability is a product of social and hazard-related variables combined. The social component of these discussions varied. In most cases, residents referenced certain socio-demographic characteristics, mainly the elderly (see first quote below). On participant also cites the Asian community as vulnerable, based on the view that they may lack social support and alternative accommodation.

Moving beyond socio-demographic profiles of the 'vulnerable other', a handful of participants described how those new to the area may be vulnerable in terms of their lack of experience and awareness of flooding. Two residents in the Bradford sample, also reflected on the longer-term impact and described how vulnerability can be created from the impact of living in a known-flood area, which essentially 'traps' people in properties that they are unable to sell (see second quote below). This example actually demonstrates the overlap between all three types of constructions for vulnerability (Figure 6.1); illustrating the tension between social-centric characteristics (i.e. finances), the hazard and existential expressions of vulnerability (i.e. feeling trapped).

Similar descriptions are also evident in the IOW study. For example, one participant who considered himself to vulnerable (in a hazard-centric sense), shared that he would feel more

vulnerable if he did not live alone and had young children in the property (third quote below). This example clearly demonstrates the intersection between hazard and social (and to some extent existential) variables, shaping declared vulnerability. Collectively, these examples demonstrate how socially-orientated characteristics intersect with views related to flood *likelihood* and *magnitude*. Furthermore, this apparent overlap of social and hazard concerns, indicates that vulnerability is constructed in terms of *consequence*.

> "I think those further round [i.e. closer to river], down there, some of those are very old, you know, a lot older than me, in their 80s and that, well people like that can't manage or anything like that" [Int 12, flood experienced; Bradford]
>
> "[T]hey are vulnerable because they are stuck with a house, they can't get out because you can't sell it at a reasonable, well at what they paid for it." [Int 4, flood experienced; Bradford]
>
> "Seeing that like I did, yes, I sometimes think now, I'm not worried for myself, I live on my own now, but if I had young kids or something like that … you know, this is a low area isn't it?" [Int 41, exposed to pluvial flooding; IOW]
>
> "For example if we got flooded here and we had to move out, I don't know where on earth we would go, none of us have got any family on the island, we're going to have two children…that's just us, abled-bodied, fit and healthy young people … it would make anybody vulnerable I think, absolutely anybody" [Int 34, flood experienced; IOW]

These hazard-social-centric constructions of vulnerability are especially evident within participants' discussions concerning the vulnerability of others. However, there was further evidence to suggest that these views inform self-declared vulnerabilities *relative* to the 'vulnerable other' (as illustrated in the first and last quotes above). These interviews indicate another facet to othering vulnerability in the spatial terms previously discussed; whereby vulnerability is ***socially othered***. Social-centric articulations of vulnerability and the notion of *social othering* are unpicked further in Section 6.4.

Summary

This section has highlighted the influential nature of visual markers in shaping residents' interpretive boundaries of flooding and hazard, social and existential constructions of vulnerability. Observations concerning attachment and detachment towards these, and corresponding shifts in the meaning assigned to these, highlight the symbolic nature of these markers; thus these may be more appropriately described as *symbolic markers* (Cohen, 1985). Although previous studies have suggested that visually-dominant geographical features on the

landscape exert the greatest influence over interpretations of flooding and constructions of risk (e.g. Burningham et al., 2008); the analysis presented here, shows that this is not simply a matter of visual dominance. Rather, other variables such as previous experience and local knowledge are accountable and inform the meaning attached (or detached) from such geographical features. In the Bradford study, there is evidence for the "levee bias" and assumption that the area is now free from risk. This observation is particularly problematic in this area, where fluvial defences actually circumvent the likelihood of pluvial flooding.

Moreover, this analysis has demonstrated the influence of these symbolic markers upon self-declared vulnerability and tendencies towards *spatial* and *social othering of vulnerability* amongst certain residents interviewed. Although "spatial othering" essentially mirrors research which documents evidence for *risk transference* (Chapter 2), emphasis is placed here on "the other" to draw attention away from *where*, onto *who* risk/vulnerability is transferred to. The importance of this distinction is unpicked further in Section 6.5. Also apparent from these interviews is the influence of physical characteristics related to flooding, upon constructions of vulnerability; to which, this discussion now turns.

6.3.2 THE INFLUENCE OF FLOOD ETIOLOGY UPON CONSTRUCTIONS OF VULNERABILITY

Flood *etiology* is a term developed to define the different driving causal mechanisms which 'shape' the spatial and temporal character of different types of hazard events (Alexander, 1993). This term originates from a traditionally technocratic perspective of vulnerability (as briefly described in Section 2.2). However, interviews with residents in the selected case studies revealed that certain attributes related to flooding are important for understanding the reasons why pluvial flooding may be overlooked in these locations. Frequency, duration, depth and causality were characteristics discussed by some residents articulating hazard-centric constructions of vulnerability, but also emerged more broadly in the analysis of residents' constructions of risk. Beyond hazard-centrism, a select number of residents also articulated social-centric and existential dimensions to these characteristics, which are also highlighted in the forthcoming discussion.

6.3.2.1 FLOOD FREQUENCY, DURATION & DEPTH

Analysis showed that hazard-centric constructions for vulnerability were partially influenced by views concerning the frequency of flooding. Whilst one might expect awareness of flood

history to heighten views of personal vulnerability, the reverse trend was observed in the Bradford study. In this location, knowledge of flood history was used to validate the view that flooding is a once in a lifetime occurrence and not something to be concerned about (n = 3; see quotes below). An important observation here, is that one of these participants validated this view (i.e. that flooding is no longer a concern), within the context of 'expert' information (see final quote below). The influence of "external knowledge" upon residents' constructions of vulnerability is a theme that will be returned to towards the end of this chapter.

> "I mean it had been flooded 50 years prior to me moving in, which, you know, 50 years … once in 50 years is nothing really is it?" [Int 11, flood experienced; Bradford]
>
> "It's not as if it's a regular occurrence in this area, 50 years between one and 50 years to another one, so … I don't ever worry" [Int 25, exposed to pluvial flooding; Bradford]
>
> "They've built flood defences up and they're assuring us that, you know, it won't happen again, that was just a one-off and it was just one problem in one place, we should be alright, you know, I don't live in fear of being flooded" [Int 10, flood experienced; Bradford]

This finding in the Bradford study, confirms existing research demonstrating how long time intervals between flood events can reduce perceptions of risk (e.g. Robertson, 2005); or in this case, lessen estimates of personal vulnerability. Whereas the previous section observed how vulnerability is spatially distanced (or 'othered'), this finding points towards the ***temporal othering*** of flood vulnerability. Through this, it appears that vulnerability is represented as either a concern of the past (i.e. pre-defences), or a distant concern for the future. Either way, vulnerability to flooding is not presented as a concern for the present "self".

Two other interviews in the Bradford study revealed another facet to flood frequency not linked to the temporal othering of vulnerability, but connected to flood awareness. Both participants believed themselves to be vulnerable to some extent, but shared the belief that a lack of awareness of previous flooding in the area will heighten the vulnerability of others (i.e. the 'vulnerable other'); e.g. "*people tend to forget … last time it flooded down here was back in the 50s, and people new to the area, they won't be aware of that*" [Int 32, exposed, primary witness; Bradford]. These examples not only highlight an overlap between hazard- and social-centric constructions of vulnerability, but also imply that awareness of flood histories can be regarded as positive and to some extent, lessen certain residents' beliefs of their personal vulnerability.

Contrasting with these observations, residents in the IOW study described how frequent flooding in the town (resulting from tidal-pluvial interaction), had become an accepted part of island-living. Consequently, although these residents acknowledged the likelihood of flooding, it was not seen as detrimental. Although this finding was not explicitly linked to hazard-centric constructions of vulnerability but with constructions of risk, it is worth juxtaposing this insight with the insights gained in the Bradford study and emphasising how views concerning flood frequency can result in different interpretations and evaluations of risk.

As this discussion to this point has shown, hazard-centric constructions of vulnerability are typically described in the context of fluvial flooding by residents in the Bradford study. Whilst the majority of residents interviewed in the IOW acknowledged the pluvial-tidal mechanisms resulting in flooding in the centre of the town; most did not regard pluvial flooding as relevant to them personally (although scientific modelling suggested otherwise in several cases). Overall, only a select number of residents acknowledged this type of flooding as potentially relevant to them (n= 6 in Bradford, and n= 4 in IOW). The discussion now turns slightly and broadens the analysis into residents' constructions of risk, as well as vulnerability, to examine the possible reasons for this.

Qualitative analysis of these interviews indicated a number of hazard-related characteristics to explain why pluvial flooding may be overlooked. Four residents in a cul-de-sac in the Bradford study, apparently discounted a pluvial flood event at the entrance to the road on the basis that it was quick to occur and quick to disperse. One participant actually described her feelings of excitement; "*It was really exciting at the time, because we never actually thought it would, you know, get into the houses...it wasn't worry"* [Int 22, exposed, Bradford]. Although this particular participant did not explicitly display hazard-centric constructions of vulnerability, others that did, also described local hotspots of poor drainage and surface water accumulation. However, these frequent, short-duration events tended to be disregarded as possible causes of flooding. A resident in the IOW sample also discounted surface water as being "real flooding", even though he has completed mitigation work to divert the flow of the water. A sample of quotes are presented in Box 6.4, illustrating the interaction between frequency, duration and depth.

Another aspect that could explain why surface water and pluvial flood events are seemingly overlooked in both samples, is that these events are seen as causing minimal disruption. Moreover, the consequences of flooding also seem to influence views about whether the event is counted as a flood. In a couple of cases, it appears that incidents resulting in minimal damage or disruption to normal daily routines are effectively discounted. Unique to the IOW study, was evidence of accepted flood norms in the context of tidal flooding in town, where flooding has become a tolerated part of island living; e.g. *"I mean I've seen them come out with a boat and go up through, you know, little boats… well I just rolled everything up and put a pair of boots on to get to work, you know"* [Int 36, primary witness, IOW]. Beyond disruption to daily activities, flood consequences were also discussed in terms of physical and financial damages from flood water. The subjectivity surrounding this discussion was very apparent in the Bradford sample, where a couple of participants described flood water entering the property, yet seemingly discounted these experiences according to the low damage caused and in relation to other residents who experienced more damages (see quotes below).

> Interviewer: Was she flooded…..[wife experienced 1947 flood]
> Participant: No she wasn't actually, the house where she lived it flooded the cellar, it just flooded the cellar and it was same across there believe it or not when we had the big bad flood in 2000, it was only their cellars across there that got flooded it never got into their property much. [Int 8; Bradford]

> "…we left the house not knowing whether we were coming back to a flooded house and thank god… everybody else were flooded, we wasn't so we came back after three days and just carried on with us lives to a certain extent, we still had water underneath the house and a swimming pool outside. … our claim was probably the lowest of the area 'cause we had only had the stuff underneath the house which was damaged and a few bits of other stuff, £1400. Where I know one guy he claimed £60,000". [Int 13; Bradford]

BOX 6.4: Urban flooding overlooked in the context of frequency, duration and depth

Examples from Bradford case study:

> "I don't think anything of it to be honest with you [surface water on main road]…it can get really deep but it doesn't last that many days" [Int 31, flood experienced household; Bradford]
>
> Speaker A: …On the main road down here if we do have heavy downfalls there is puddles forming around the storm drains where it just can't cope with the amount of water … but I think the flood defence or the storm drains and what have you can cope with it eventually, you know it just takes a bit of [time]...
> Interviewer: …would you count that as a flood?
> Speaker A: No I wouldn't, it's a puddle. [Int 13, flood experience; Bradford]
>
> "but I wouldn't say they'd actually flooded to stop the traffic, but you'll see them at the sides of the roads, great big puddles … I don't think they'd actually cause flooding of houses would they? You know, I don't think that would cause flooding of houses, heavy rainfall, I mean people who live higher up they get puddles on the roads, basically because they've got dips in the roads, you know, they're not going to flood their houses" [Int 11, flood experienced household; Bradford]

Example from IOW case study:

> "When it's really been heavy it's been almost like a river going down but that doesn't happen very often." [Int 46, not exposed to flooding; IOW].
>
> Speaker A: It just runs down the gutters. That isn't a problem for us, we don't get a problem obviously where we are [on a hill]…
> Interviewer: …would you count that as a flood?
> Speaker A: I wouldn't actually because it doesn't affect me. [Int 44, not exposed to flooding; IOW]
>
> "I mean yes there has been even down this road sometimes if we get a real cascade I have known it to come down through next doors drive and it goes down through, but it is not real flooding it is just an inch of water perhaps… you know as soon as the storm stops it has finished and so what I did I raised up the front part of the entrance both here and next door so that water then went on further down the road and it goes down now across the allotments over there" [Int 43, exposed to flooding; IOW]

It is noteworthy, that no one within the Bradford sample had directly experienced pluvial flooding in the area; thus it cannot be assumed that this finding is purely driven by the physical-flood characteristics described. Nonetheless, this analysis clearly demonstrates the relevance of these characteristics in shaping residents' views of flood risk, and hazard-centric vulnerability in some cases.

Further analysis, indicated that surface water "puddles" and heavy rainfall divert certain residents' attention towards the visual (and symbolic) markers described in the previous

section. Whereas attention is transferred towards the river in the Bradford study; attention is directed towards the town centre as a natural topographic low in the area and a known hotspot for flooding in the IOW study. In the Bradford study, this process of *transference* was evident in eight participants with hazard-centric constructions, five of whom have previously experienced flooding in their current property (see example below).

> "It worries me now, you know, especially if we get a lot of heavy rain, I take the dog for a walk and see the river's up and I think oh for God's sake let's hope we're not going to get flooded again" [Int 11, flood experienced; Bradford]

This finding highlights the influence of experience and local knowledge upon constructions of hazard-centric vulnerability, and indicates an unspoken assumption amongst certain residents that future flooding will be identical to flooding encountered in the past. Arguably, this finding provides further evidentiary support for the "availability heuristic" reviewed in Chapter 2 (Tversky and Kahneman, 1974; Mileti and O'Brien, 1993; Haynes et al., 2008). However, it is difficult to discern whether this finding is purely governed by the 'availability' of past memories or potentially influenced by *affect* (Slovic et al., 2004; Weinstein et al., 2000). The fact that this assumption is evident in both experienced and witness participants, i.e. those who experienced significant negative affect and those who did not; suggests that both availability and affect heuristics may account for this finding. These observations point towards a potential negative outcome of *living flood histories*, whereby other sources of flooding (i.e. surface water and pluvial flooding), are potentially overlooked. Indeed, contrary to scientific evidence, the majority of participants in the Bradford and IOW studies did not consider themselves to be at risk from these types of flooding. There were exceptions to this pattern in the IOW sample, which included two participants with previous pluvial flood experience. In this instance, one participant described how heavy rainfall in fact triggers community action and flood mitigation; "*there's a bit of a community spirit and if it does really start to rain, we'll go along and close all our gates* [flood gates] *if we're not here*" [Int 34, flood experienced household, IOW]. In this case, it seems that previous flood experience and local flood awareness in the area has forged an attachment to heavy rainfall as a potential cause of flooding in itself.

Overall, in-depth examination of these interviews reveals that constructions for hazard-centric vulnerability (and risk more broadly), manifest in different declarations of vulnerability depending on the type of flooding. From the analysis, it seems clear that vulnerability is

constructed in relation to specific types of flooding; consequently, self-declared vulnerabilities must be understood within this context. Moreover, there is a tendency for vulnerability to be constructed in relation to *known* and/or previously experienced types of flooding; meaning that the unknowns or overlooked types of flooding (i.e. pluvial flooding) are not considered amongst the majority of those interviewed.

6.3.2.2 FLOOD CAUSALITY

Whilst some researchers have argued that the origins of a flood are irrelevant from the perspective of a flood victim (Messner et al., 2006), qualitative analysis of the Bradford sample revealed that certain residents' views of flood causality influence their constructions of vulnerability in two ways. Firstly, views related to the likelihood of flooding appear to vary depending on the type of flood; where 'flood type' distinguishes between floods interpreted as 'natural' or man-made in origin. Secondly, the type of flooding (natural versus man-made) appears to be linked to existential securities and insecurities amongst certain residents.

As discussed in Section 6.3.1, many residents interviewed in the Bradford study did not always associate the rivers with flooding, despite awareness of previous flood events in some cases. Further analysis revealed that in instances where human error was attributed to flooding and blame assigned, the flood event was essentially discounted as a "real" flood (see quote below). Whilst the previous section observed how long time intervals between flood events seems to reduce views of risk and hazard-centric vulnerability (i.e. "*temporal othering"*), this analysis suggests that this finding is also linked to residents' views on the cause of flooding. Indeed, it seems that 'legitimate' floods are associated with natural causes, namely the river and weather. This was apparent in four flood-experienced residents who discussed the rumours surrounding the 2000 or 1947 flood events and speculated about whether it was a manmade decision to intentionally flood the area in order to protect the neighbouring town.

> "Yes that was not due to the weather that was due to a damn sluice gate been left open and it flooded the thing so that wasn't what you would call….well it was flooding but it wasn't weather wise or anything like that". [Int 8, flood experienced]

Vignette-elicited discussions also revealed how residents discounted the pluvial flood depicted in the story. The resulting flood in Vignette 1 (see Section 4.5.2), led to discussions of blame

and accountability, but was not typically regarded as a cause for concern. Instead, there was a view that the 'flood' was most likely a one-off and not something for the characters to be necessarily concerned about in the future. Although this evidence is mainly emergent from the examination of residents' constructions for *risk* and not explicitly linked to hazard-centric constructions of vulnerability *per se*; the influence of causality upon the latter, is implicit in five cases in the Bradford study (including two flood-experienced participants and three primary witnesses); and one participant in the Isle of Wight study, who distinguishes between sewer flooding and "*ordinary, straightforward flooding*" from heavy rainfall [Int 38, flood experienced]. In the IOW study, where surface water and pluvial flooding are regarded as more frequent and associated with tidal flooding in the centre of the town, the distinction between 'man-made' and 'natural' floods is considerably less than that observed in the Bradford study. In the Bradford study at least, it seems that floods attributed to man-made causes are deemed less likely to occur in the future in comparison to 'natural' floods. This observation has implications for understanding residents' hazard-centric constructions of vulnerability, informed on the basis of flood likelihood.

Analysis of resident interviews showed that there is a general consensus amongst participants that flooding is increasing in frequency and severity, due to changing climate and/or human activities (e.g. poor spatial planning, aging infrastructure). However, whilst it was observed that "natural" floods especially, seem to be increasingly regarded as less predictable and therefore more threatening, this generally seems to be considered to be a matter for other people and places. In the Bradford study, this was mainly attributed to the presence of flood defences and faith in the ability of defences to harness nature; i.e. fluvial flooding is apparently brought within the realms of control. In fact, fifteen interviewees (including nine flood experience residents) described feeling more secure and certain that flooding will not occur again with defences in place. In the context of the Bradford study, it seems that the **construct of 'control'** is influential, both to constructions of risk and hazard-centric vulnerability. Indeed, analysis showed that the view that fluvial flood risk is now under control, seems to lessen evaluations of personal, hazard-centric vulnerability amongst several residents (n=6). Furthermore, analysis shows how this construct for 'control' translates into feelings of *existential security* (previously observed in the context of visual markers). In conclusion, these findings suggest that it is not flood causality *per se*, but underlying construct of *control* related to causality, that shape constructions of vulnerability.

Possible reasons for seeking "man-made" causes of flooding

As previously reported, the attribution of blame was evident in the flood narratives from the 2000 flood event in the Bradford study; including accounts of scandal and descriptions of poor spatial planning and drainage management (Box 6.5). This tendency towards fault-finding was predominantly apparent in flood-experienced residents and also emerged in several vignette-elicited discussions. Some authors have argued that the presence of rumours and conspiracy theories is a telling signal, indicating a disparity between official and unofficial risk communication (Handmer, 2000; Haynes et al., 2008). On one hand, the presence of these findings here, could indicate possibly poor communication surrounding the 2000 flood event or distrust in the authorities. However, given the observed association between *control* and *existential securities and insecurities*, it might be argued that there are deeper, emotive reasons why people gravitate towards "man-made" causes to flooding.

Ontological security is one possible theory for explaining this finding (Giddens, 1991: Harries, 2008). Chapter 2 mentioned the research conducted by Harries (2008), which approaches ontological security from the perspective of *social representations*. Harries argues that residents' search for blame is an attempt to preserve the representation of nature as something positive and benign. Moreover, blame implies solutions (e.g. flood defences) and maintains the representation of the state as the guarantor of security. Collectively, these social representations act to restore ontological security.

BOX 6.5: Assigning blame – Residents' preference for man-made causes of flooding: Bradford case study

"…those houses across there, they had been built the year before and someone had protested to the council that if there were a flood it would be bad… If they hadn't have been there it would have gone right across the valley and it wouldn't have been that deep..." [Int 3, flood experienced]

"And this estate at the back, it's built a metre higher than ours … which we objected to at the time, we weren't even thinking about floods then, but in hindsight when they came round and looked at the area they said that shouldn't have happened, because if it had been as it was before the water would have come down, gone there and gone into the River Worth and away" [Int 6, flood experienced]

"…the other thing afterwards when they had an enquiry in the hall afterwards…..and I think this was true, I really believe this that the drains are not properly cleaned like they used to be. You know I think there is a big problem… I can remember the time when the Council came every month to clean the drains, we get them once every 12 months now down here." [Int 8, flood experienced]

"…he said they thought you know if the canal is going to overflow then there is going to be a lot of life lost here so they drained goodness know how many million gallons out of that on the Monday afternoon and it went into the river and that is why you were flooded next day. … I am certain because they did it Monday afternoon and we were flooded Tuesday and I mean at 9 o'clock at night when my son went to look on Monday night there was no danger of it flooding so you know, you just put two and two together" [Int 4, flood experienced]

During the course of interviews, participants were asked to discuss their attitudes towards FRM. The majority of participants in both locations shared the view that central government is fundamentally responsible for flood risk prevention; e.g. "*I think they have really got to think about flood defences, you know I think it is a big thing now. It can happen anywhere, anytime to anybody, I don't think anybody is safe from it really now*" [Int 8, flood experienced household, Bradford]. Implicit in these descriptions is the view that flooding can be prevented and flooding *should* be prevented. While Harries (2008) asserts that natural floods are deemed as less threatening, this analysis supplies another interpretation. In light of the observations regarding control, it is argued here that, while natural floods may be viewed as more acceptable, man-made floods are arguably *preferable* amongst residents. As discussed in psycho-social and natural hazards literature, control (or lack of control) is linked to people's estimates of risk and their corresponding responses (Weinstein, 1983; Rothman et al., 1996; see Chapter 2). It might be theorised here, that constructions and preferences displayed towards man-made flooding constitutes an underlying coping strategy to ease anxiety, make the uncertain certain and uncontrollable controllable (Bandura, 1982). In the Bradford study, this argument is evident as participants' communicate an overwhelming sense of relief and safety since fluvial flood defences were installed, which serves to lessen (or even eradicate)

views of risk and vulnerability.

An alternative theory to ontological security, is that residents' tendency to assume anthropogenic causes of flooding results from *cognitive dissonance* (Festinger, 1957). As mentioned in Chapter 2, flooding can conflict with previously held views of security and beliefs that an area is risk-free. According to Festinger (1957) cognitive dissonance is both discomforting and intolerable and requires a change in the behaviour or belief in order to minimise or lessen this dissonance. The tendency to assign blame and search for man-made causes of flooding could be one such strategy; flood occurrence cannot be altered, but the beliefs surrounding flooding can. In this sense, the association of flood causality to human action is a means of reducing the dissonance between previously held views and flood reality. Again, this theory implies that constructions of flood causality are influenced by existential processes, beyond hazard-centrism.

This section has highlighted the apparent influence of flood causality upon constructions of vulnerability, although it has also shown that it is not *causality* per se that is of interest. Instead it seems that underlying constructions of control may drive the search for ontological security, or alternatively, result from cognitive dissonance. The key point to observe here, is that residents' discussions of causality can be linked to hazard-centric and existential constructions of vulnerability, and corresponding views of self and others' vulnerabilities.

Implications for FRM

In turn, further analysis showed that participants were less willing to accept the view that householders should be partly responsible for managing the risk of flooding to their properties, when considering 'human induced' floods. Linked to these discussions were concerns for social justice. Echoed by several participants in both study sites is the view that households should not have to subsume the cost of flooding, particularly when flooding is attributed to human decision making; such as the decisions in spatial planning, poor communication from landowners concerning risk or poor drainage management. Correspondingly, these residents argued that households should not be responsible for flooding consider to be unfair. Equally, there was also evidence to suggest these feelings of inequality surround 'natural' floods; *"it's not our fault if it happens, it's accidental isn't it? … you can't help if something floods… I think everyone should pay the same [insurance] if it's anything to do with flooding because it's no-*

one's fault, [it's] nature." [Int 21, inexperienced, not exposed; Bradford]. In this context, understanding residents' interpretations of flood causality is not only relevant for understanding constructions and patterns of self-declared vulnerabilities; but may also present a barrier to current agendas for enhancing household and community responsibility in FRM.

Related to this, several residents in the Bradford study did not believe that options for household mitigation would be effective in minimising or preventing flood damages to the property (n=8). This was especially evident in those who had previously experienced or been primary witnesses to flooding. Further analysis indicated that residents based this assumption on the flooding encountered in the past and with this, a tendency to assume the worst case scenario. Simultaneously, these views appeared to reflect an underlying sense of a *lack of control* amongst these residents. In these instances, residents are reliant upon the success of the defences and seem to seek security in this "proxy control" (Bandura, 1982; Chapter 2). This finding supports existing research documenting the effects of "learned helplessness" in human decision making, namely the decision 'not to act' (Fernandez-Bilbao and Twigger-Ross, 2009).

6.3.3 CONCLUSIONS

This section has examined the ways in which characteristics of flood hazard appear to influence constructions of vulnerability and self-declared vulnerabilities. Interestingly, this analysis has shown that it is not only hazard-centric constructions of vulnerability informed by hazard-related characteristics, but also social-centric and existential expressions of vulnerability. These insights are summarised in Table 6.3.

A key finding is that vulnerability is constructed differently for different types of flooding. Moreover, there is an assumption amongst flood experienced and witness participants that floods that occur in the future will be identical to those that occurred in the past. This finding lends further support to existing research documenting the effects of the "*availability*" and "*affect*" heuristics (Tversky and Kahneman, 1974; Mileti and O'Brien, 1993; Slovic et al., 2004). There are a number of implications of this finding. Firstly, this implicit assumption seems to constrain these residents' constructions of risk and hazard-centric vulnerability (towards the self and others), making them less open to previously un-encountered, yet objectively-identified, risks (i.e. pluvial/surface water flooding). Secondly, analysis of interviews in the

Bradford study showed that this tendency to assume the worst case scenario seems to be linked to feelings of helplessness and the view that, as householders, nothing can be done to prevent or minimise the flood damages. Consequently, this seems to foster reliance upon engineered defences and undermine views about the effectiveness of household mitigation options.

This research thus emphasises the importance of understanding the subjective (or 'symbolic') boundaries of flooding held by residents in these locations, especially as these appear to be at-odds with equivalent objective boundaries derived from scientific modelling. Tendencies towards *spatial othering* of risk and vulnerability were observed in some residents, particularly those with first-hand experiences of flooding in Bradford. On one hand, this might reflect an *optimistic bias* (McIvor and Paton 2007); however the association with existential securities/insecurities implies that this process is driven by emotive processes (discussed further in Section 6.5). Furthermore, existing research has shown the recognition of personal risk and vulnerability is important for adopting precautionary behaviours (Weinstein and Lyon, 1999).

Table 6.3: The influence of visual markers and hazard-related characteristics upon constructions of personal vulnerability

Type of vulnerability construction	**Self-declared vulnerability**	
	Variables heightening appraisals of personal vulnerability	**Variables lessening appraisals of personal vulnerability**
HAZARD-CENTRIC	▪ Attachment to visual ('symbolic') markers, including proximity to viewed cause of flooding and known boundaries of previous flood events ▪ Floods deemed as 'natural' are viewed as more likely to occur in the future	▪ Attachment and detachment from visual ('symbolic') markers, signifying distance from viewed cause of flooding and known boundaries of previous flood events ▪ *Spatial "othering"* of vulnerability from the self, onto the 'vulnerable other' ▪ *Temporal othering* of vulnerability, related to infrequent flooding (Bradford only) ▪ Frequent, short-duration and minimal depths of water observed for surface water/pluvial events overlooked. Contrary to scientific modelling, this type of flooding is not regarded as personally-relevant to the majority of

Type of vulnerability construction	Self-declared vulnerability	
	Variables heightening appraisals of personal vulnerability	**Variables lessening appraisals of personal vulnerability**
		those interviewed in both case studies ▪ Floods deemed as 'man-made' are viewed as less likely to occur in the future
SOCIAL-CENTRIC	▪ Interaction between self-characteristics and flood characteristics, heightening views of vulnerability (during flood); evident in 1 participant in IOW study. ▪ View that flooding creates long-term vulnerability; i.e. impact to property value "traps" people in an area at-risk of flooding (n= 2, experienced residents in Bradford)	▪ Interaction between self-characteristics and flood characteristics, lessening views of personal vulnerability (during flood) ▪ Awareness of flood history (i.e. frequency of flooding) lessens views of personal vulnerability in relation to those who are unaware
EXISTENTIAL	▪ Attachment to visual markers heightens feelings of insecurity and vulnerability, mainly in experienced residents and primary witnesses to previous floods ▪ Floods deemed as 'natural' are linked to heightened feelings of insecurity and vulnerability, than floods deemed as 'man-made'	▪ Attachment and detachment from visual markers heightens feelings of security; this is evidenced in a select number of flood-experienced residents (Bradford), but mainly in inexperienced residents in both case studies

Analysis has also highlighted the importance of visual (or "symbolic") markers in shaping constructions of risk and vulnerability. Visual markers could be used to facilitate risk communication and enhance risk awareness if successfully 'attached' with flooding. Although it may be particularly challenging to evoke this attachment from residents with no flood experience, visual markers could provide a spatial reference point for previous flood events (extent and depth), as well as different types of flooding. Potentially, this strategy could reduce the tendency for residents to remove or distance flooding from themselves, and encourage them to confront and respond to risk. However, such visual markers also pose a number of barriers. Some markers may enforce flood norms (i.e. fluvial and tidal flooding) and mask other types of flooding. Also, there is also a fundamental question about whether markers are beneficial or not. From this analysis, it seems that visual markers may constrain people's ability to think flexibly about other types of flooding and flood events beyond representations of the

past. As emphasised by Fernandez-Bilbao and Twigger-Ross (2009), there is a need to increase public awareness of the 'peculiarities' of flooding, beyond 'traditional' types of flood events (i.e. fluvial or coastal).

Flood defences present an added challenge. In the Bradford study, it is clear the fluvial defences dominate constructions of risk and vulnerability; yet, these defences exacerbate the risk of pluvial flooding in this location (Chapter 3). This complexity is poorly understood amongst the residents sampled for this research, to the point that some residents believe that they are now free from flood risk and vulnerability (especially flood experienced residents). Importantly, this finding was observed in some residents who described assurances from 'experts' that the area would not flood again. This highlights the importance of careful communication in complex risk spaces such as this. This analysis has also shown that strategies for preserving flood histories and 'living memories' need to consider the potentially negative effect of communicating flood frequencies, causality and locations of previous flooding.

6.4 SOCIAL-CENTRIC CONSTRUCTIONS OF VULNERABILITY

Social-centric constructions dominated discussions on vulnerability in both study sites, reflecting the view that certain members of society, with specific characteristics, are more susceptible to adverse consequences of flooding and are less able to adequately respond and recover. This section further unpicks the initial analysis presented in Section 6.2 and considers the influence of experiential and normative constructions upon evaluations of self-vulnerability, and views on the vulnerability of others. This discussion then addresses how social-centric constructions of vulnerability are informed and altered through participants' resources for coping. Points of convergence with other construction-types are considered throughout this section.

6.4.1 EXPERIENTIAL AND NORMATIVE INFLUENCES UPON SELF-DECLARED VULNERABILITY

Residents interviewed for this research expressed a number of reasons why they would or would not consider themselves to be vulnerable if a flood event were to occur. From the analysis of social-centric constructions, it appears that self-declared vulnerabilities are largely determined by the extent to which participants identified themselves with so-called vulnerable individuals. Whilst the previous section highlighted how the 'vulnerable other' is spatially

identified, in this instance the 'vulnerable other' was identified from certain socio-demographic characteristics. Participants from both studies articulated similar profiles of vulnerability, which dominantly included the elderly, those living alone, young families and those with constraints on physical mobility. However, further analysis showed that the characteristics and reasons for their selection, varied between participants.

It was evident from certain interviews, that some participants describe the characteristics of a vulnerable person with a sense of stating the obvious and assumption that vulnerable groups are uncontested and universally defined. These descriptions imply that vulnerability is conceived as an inevitable condition belonging to certain social groups. Essentially, these groups are identified by certain residents, on the basis of physical dependency; i.e. if a flood was to occur, these groups would need physical assistance to adequately respond to flooding and would be dependent upon others. This type of response indicates that vulnerability is contextualised in the context of flood *response* and evacuation. This perspective appears to highlight a normative influence to constructions of vulnerability and the role of broader social values in defining the 'vulnerable other'. In this instance, vulnerability is identified according to the characteristics which deviate from the desired social norm for autonomy. Other authors have similarly reflected upon this notion of a 'desired self' within normative standards of being and observed how vulnerability is presented as a shortcoming in western discourse (Shildrick, 2000: Spiers, 2000; Shapiro, 2008). To summarise, this is referred to in this thesis as ***normative constructions of vulnerability***. In turn, these appear to inform these participants' declarations of vulnerability, based on the extent to which they associate or dissociate themselves from the established norms of the vulnerable other.

In contrast, a handful of participants seemed to draw from their personal experiences when describing their views on personal vulnerability and the vulnerability of others. In these instances, it was observed how residents drew from first-hand observations in justifying their answers; for example, describing the health impacts of flooding upon elderly neighbours or discussing the types of people that they had offered to help in the past. Although these participants also described characteristics relevant to the response phase of flooding, based on physical mobility (e.g. elderly, young children), there were also more likely to reflect on how these characteristics might influence abilities to recover. Constructions which seemed to be informed through experience are referred to here as ***experiential constructions of vulnerability***. The distinction between normative and experientially-shaped constructions is

outlined in Box 6.6, below. The important role played by *flood experience* has been well documented in risk research (discussed in Chapter 2). Indeed, Slovic et al. (2004) also make the distinction of *experiential* systems in people's appraisals of risk, arguing that this system is reliant on images and narratives. The analysis presented here, further emphasises the important of experiences in constructions of social-centric vulnerability. That is not to say that those drawing from their personal experiences are devoid of normative influence, in reality this distinction is likely to be less binary than that presented in Box 6.6.

BOX 6.6: Distinguishing between *experiential* and *normative*-based constructions of vulnerability

EXPERIENTIAL CONSTRUCTIONS are informed by either personal experience or interactions with those who have experienced flooding. Participants often draw from these experiences to justify their perspective on vulnerability.

> Example: "*If you haven't been flooded you just don't know … there was a lady down the street there, three streets and it….to be quite honest it turned very, very ill. […] I think as you get older it is harder to accept these things*" [Int 8, flood experience, Bradford]

NORMATIVE CONSTRUCTIONS are informed by social norms of what constitutes a vulnerable person. In terms of social-centric constructions of vulnerability, vulnerability appears to be conceived as an inevitable condition of certain social groups deemed as lacking physical and emotional autonomy. This can be identified through the lack of personal experience and explicit phrases such as "obviously", indicating that vulnerability is uncontested and universally defined.

> Example: "*Obviously it's the elderly that can't get out and that can't help themselves. People that can't help themselves, yes, definitely*" [Int 36, exposed to flooding, IOW]

To this point, this discussion has presented normative and experiential influences to social-centric constructions of vulnerability, as if they were polarised and mutually exclusive. In reality, this is difficult to discern, because arguably everyone is to some extent influenced by socio-cultural frames for understanding. Moreover, there is an apparent gradient between the two, as certain participants referenced examples from indirect experiences (e.g. second witnesses to flooding), or even examples from the media.

A key point to note here, is that those objectively defined as vulnerable (e.g. elderly, single parents; see Chapter 2) do not necessarily associate themselves with this category. People uphold multiple identities and evaluate (and weight) different personal qualities in their constructions. For example, one participant and single mother of two young children explicitly distinguishes herself from this category and identifies herself as someone who is resilient. Similarly an elderly participant who lives alone remarks, *"the elderly living alone [are*

vulnerable], which is me really, but most of us have got families" [Int 10]. This was also observed amongst those living in rented accommodation. Whilst these participants reflected on their hypothetical flood vulnerability and described financial concerns (i.e. several had no contents insurance) and practical concerns (i.e. temporary living arrangements), renting their current property was in fact regarded as beneficial and lessened views on flood vulnerability (and risk); e.g. "*I don't think it would bother me, I'd probably just move somewhere else*" [secondary witness, exposed to flooding: Bradford]. These findings are at odds with the etic-orientated constructions of vulnerability which often list non-home owners as a vulnerable group (e.g. SFVI, Tapsell et al., 2002; see Section 2.5). Overall, ten participants considered themselves to be vulnerable on the basis of their socio-demographic characteristics across both case studies (e.g. age, single parent household, finances and health).

Association and dissociation with the vulnerable other dominantly seems to explain why certain residents considered themselves to be vulnerable whilst others did not. Analysis suggests that participants tended to associate or dissociate on the basis of *similar* or *dissimilar* characteristics, between themselves as 'the other'. Several explicit and implicit examples are presented in Box 6.7. Interestingly, association did not always result in self-declared vulnerability. A number of partial associations were observed, but whereas some participants acknowledged similar characteristics and felt that these could contribute to vulnerability; others drew attention to observations of differences, thus distinguishing themselves from the vulnerable other. This latter finding was especially evident amongst those exhibiting normative-based constructions of vulnerability based on physical dependency.

BOX 6.7: Association and dissociation with the "vulnerable other" in both case studies

Examples of association:

> "We are vulnerable if you are flooded … if you are twenty and it happens and you are flooded you can ride over it" [Int 4, flood experienced, Bradford]
>
> "…seeing as you get older, you know we are getting on a bit now and I think if you are younger you can cope better but I think as you get older it is harder to accept these things" [Int 8, flood experienced household, Bradford]
>
> "Well everybody's vulnerable if it floods aren't they" [Int 38, exposed to flooding, IOW]

Examples of dissociation:

> "Well I should imagine families if they have nobody else and old people, I mean I am in my 70's but I'm reasonably agile" [Int 3, flood experienced, Bradford]
>
> "The elderly living alone, which is me really, but most of us have got families" [Int 10, flood experienced, Bradford]
>
> "Vulnerable people, like ill or old or young children, and obviously people who do need financial help or even emotional help, if someone doesn't have anyone around or able to help them, or they're not good at coping on their own… I think I'm quite good at coping on my own, I've had to be" [Int 16, exposed to flooding, Bradford]
>
> "Well I mean I was interested in the snow in the winter, but the person who at that time had only just moved into the house there, knocked on my door and said, we've noticed that you haven't been out for a couple of days, are you alright? … I was fine, you know, but it just made me think, I am the old person that people are constantly being told you have to look out for [Int 42, exposed to flooding, IOW]

It is noteworthy that constructions of vulnerability can manifest in binary or graded boundaries, distinguishing residents' views towards 'the self' from their views towards the 'vulnerable other'. Participants displaying a binary view of vulnerability, often described it as a condition unique to specified social groups; i.e. people are described as either vulnerable or not vulnerable according to their belonging to these groups (e.g. "*Obviously it's the elderly that can't get out and that can't help themselves*"; Int 36, IOW). In contrast, others observed a gradient in vulnerability and considered how vulnerability might be heightened amongst certain groups in society, but may also manifest in anyone exposed to flooding (e.g. "*it would make anybody vulnerable I think"*; Int 34, IOW). Whereas the former construction is tied to rigid thresholds of vulnerability, the latter construction somewhat blurs these boundaries. Both binary and graded expressions of vulnerability were observed across and between participants in the selected case studies. Although graded boundaries tended to be evident in

participants who articulated a degree of uncertainty towards their personal vulnerability, there were no other discernible patterns. Indeed, in the IOW case study, residents who did not consider themselves to be vulnerable, displayed both binary and graded boundaries. In addition, binary distinctions were equally linked to those who did not consider themselves to be vulnerable, as well as those certain of their potential vulnerability.

This section has highlighted the influence of social norms and experiences in shaping residents' constructions of vulnerability. These not only appear to influence appraisals of the self, but also appraisals of others; moreover, these appear to be mutually informative as people draw from observations of difference and similarities to associate or dissociate themselves to/from the 'vulnerable other'.

6.4.2 MEDIATING SOCIAL-CENTRIC CONSTRUCTIONS OF VULNERABILITY WITH RESOURCES FOR COPING

One of the main reasons that residents appeared to dissociate themselves from their constructions of the 'vulnerable other', is due to their resources for coping. From this analysis, a number of 'resources' emerged, including;

- **Social networks**, through family, friends and neighbours
- **Personality traits**, such as the ability to accept the situation and bounce back to normal
- **Acquired practical skills** from previous flood experience

Appraisals of self-vulnerability seemed to be reduced (or erased altogether) in cases where the participant identified with their resources for coping, which seemed to overwrite or counteract potential sources of vulnerability. Thus, even in cases where the participant shares like characteristics with those identified as vulnerable, it is not necessarily the case that the participant will equally consider themselves to be vulnerable. For instance, one woman considers elderly people living alone to be particularly vulnerable (see Int 10 in Box 7), but despite the obvious similarity, would not class herself as vulnerable in light of family support.

In the Bradford study, previous flood experience also seemed to influence constructions of vulnerability. For some, this was discussed with a sense of acquired resilience obtained

through learned practical skills relevant for flood response (e.g. knowing what to save) and in the months following (e.g. negotiating insurance); "*I've done it, been there, done that, got the t-shirt*" [Int 9] and "*you learn big time about what to save*" [Int 8]. In fact one participant explicitly states that previous flood experience is "*the reason you'd cope"* [Int 12].

Equally relevant to this discussion are the residents who described that they would struggle to cope if a flood occurred and would therefore be vulnerable. This emerged in some residents in the Bradford study as they compared the past with their current situations; in these cases, the loss of a spouse or partner, and deterioration in health were cited as reasons for vulnerability. In contrast to the previous point of discussion, flood experience also seemed to result in diminished views of coping and heightened views of self-vulnerability towards future flooding. In the Bradford study, some residents reflected on how flooding had created new emotions, such as doubt, uncertainty and anxiety; *"you've always got that fear at the back of your mind, is it going to do it again?"* [Int 1]. Moreover several participants went on to explain that they could not cope with flooding if it were to ever happen again; *"I mean if we were* [still at-risk]*, I mean I wouldn't be able to do what we did last time"* [Int 3]. These emotions were connected to a host of variables related to negative aspects of flood experience, such as conflicts with insurers and "cowboy builders", and the emotional insecurity created with the temporary loss of home[48].

> "I don't think you could do that again, it is too traumatic, it is too much stress. I mean it is only furniture, it is not a person's life, but it is your life because you have spent all these years building this life and all of a sudden in a few hours it has gone, there is nothing there." [Int 4, flood experienced household, Bradford].

Constructions also seemed to be influenced by memories concerning others and, in a couple of cases, through comparisons (and association) of the current-self to known individuals at the time of the flood. For example, two participants recalled significant emotional and health impacts upon elderly friends and neighbours and similarly shared the view that that future flooding would incite the same reaction in them; e.g. "*I think as you get older it is harder to accept these things …if you haven't been flooded you just don't know … there was a lady down*

[48] "Loss of home" was coded in flood narratives and describes the impact of flooding upon constructions of 'home'; where 'home' may be discussed in concrete or symbolic forms. In these accounts the home is represented as something lost or diminished as a result of flooding. The impact of this upon identity of self and place has been explored in other research (Coates and Fordham, 2000).

the street there….to be quite honest it turned very, very ill" [Int 8]. In these cases there appeared to be a degree of resignation of the self to becoming vulnerable.

These examples suggest an existential quality to certain characteristics discussed in the context of vulnerability and coping. This was particularly evident in discussions concerning the elderly and those living alone, who were sometimes described as groups that might *feel* vulnerable and experience other emotions related to insecurity, such as fear and worry, as illustrated in the quotes below. Although existential constructions of vulnerability were only evident in a select number of participants, existential facets to socio-demographic characteristics were also implicit in several other interviews.

> "Well it's made them feel vulnerable hasn't it and it has made them feel oh perhaps this could happen, perhaps we might think about moving. ... but no even if they are insured it is still a big thing if you are going to lose your home so they are forced to feel a little bit vulnerable and they are forced to have talked about it afterwards, heavens we were lucky then, what if it happens again, you know" [Int 4, flood experienced, Bradford].

> "And perhaps people on their own [would be vulnerable], whether it's elderly or young. You can get the young ones that worry as much or more than the elderly people … And if it's a mum with children, a one parent family, she might feel that she has nobody, she's on her own" [Int 6; flood experienced household, Bradford].

Also apparent in this analysis is that the characteristics described by residents in the context of vulnerability and coping are weighted differently across the different temporal concerns of the so-called flood cycle (preparation, response and recovery). For instance, one participant explains that whilst insurance can help in flood recovery it doesn't give people *'the umph'* in the same way as family support; "*it doesn't take the anxiety away but it helps to bear it"* [Int 17, secondary witness, Bradford]. Vignette discussions also showed how certain characters and features of the story were ranked over others, such as the presence of children (vignette 1) over the elderly mother (vignette 2). This was also apparent in flood narratives in the Bradford case study as several experienced participants described how they directed the emergency services to certain households, or how they themselves sought to help certain neighbours; namely elderly neighbours living alone and those with young families. Furthermore, it was observed that participants draw from specific facets of defining-characteristics of vulnerability and coping. Old age for instance, was associated with constraints on physical mobility, relevant for discussions of vulnerability and also connected with diminished ability to cope (physically and emotionally) with the impacts of being flooded; e.g. "*when you're over 75…your mobility starts to fail…something like this [i.e. flooding] can be very traumatic and that can be the thing*

that triggers off all kinds of other illnesses" [Int 45, IOW]. These findings are summarised in Table 6.4. Such descriptions illustrate the multi-faceted nature of socio-demographic characteristics and highlight the importance of understanding the context and temporal setting in which social-centric constructions of vulnerability are situated.

Table 6.4: The different facets of characteristics cited in social-centric constructions of vulnerability and coping; observed in Bradford and Isle of Wight case studies

Characteristic	Preparation & Response	Recovery
Elderly	▪ Constraints to physical mobility ▪ Lack of social networks ▪ Most likely to live alone (see below)	▪ Less able to emotionally cope (i.e. acceptance) ▪ Less able to practically cope (i.e. negotiating insurance, builders etc.) ▪ Susceptible to health impacts
Young	▪ Constraints to physical mobility ▪ Dependent on others	▪ Less able to emotionally cope ▪ Susceptibility to health impacts
Live alone	▪ Limitations to preparations to protect property and belongings ▪ View that those living alone are less likely to act quickly	▪ Implied lack of social networks ▪ Coping alone is deemed more difficult without someone to share financial, practical and emotional burdens
Young families	▪ Limitations to preparations to protect property and belongings ▪ Concern for young (discussed above)	▪ Emotional impact to young children (see above) ▪ Logistical and financial concerns
Single parent households	▪ Limitations to preparations to protect property and belongings ▪ Concern for young (discussed above)	▪ Emotional impact to young children (see above) ▪ Logistical and financial concerns ▪ Coping alone is deemed more difficult without someone to share financial, practical and emotional burdens
Those with a limiting illness or disability	▪ Constraints to physical mobility ▪ Dependent on others	▪ Susceptibility to health impacts ▪ Less able to emotionally cope ▪ Dependence on others for financial and practical support
Flood experience	▪ Awareness of what to do and how to respond	▪ Awareness of how to negotiate insurance, builders etc. ▪ Heightened sensitivity from previous experience evident in some, and linked to views of diminished abilities to cope (i.e. residual vulnerability)
Social support networks	▪ Practical and emotional support	▪ Practical, emotional and potentially financial support

This section has shown how residents' constructions of vulnerability and self-declared vulnerabilities are shaped through their resources for coping; moreover, these appear to be somewhat combative to evaluations of vulnerability. This finding seems to support the conceptual framework presented in Chapter 2, which showed coping to be an internal feature of resilience, and resilience and internal feature of vulnerability. At a time where households are requested to become more self-reliant and resilient to flooding, there is a need to identify the variables which residents count as resources, or potential barriers, for coping.

This study confirms the importance of social networks emphasised in existing research (Aspinwall and Taylor, 1997; Handmer, 2000; Parker et al., 2009). However, whilst previous flood experience is typically conceptualised as an indicator of resilience (Section 2.5), this analysis reveals a negative impact of experience which seem to heighten some residents' feelings of vulnerability (i.e. existential constructions). It is important to acknowledge such intangible consequences of flooding and understand how the experience itself can weaken individuals' beliefs in their ability to cope. Flooding can negatively impact an area in both tangible and intangible ways, and this can remain years after the initial flood event, as evidenced in the Bradford case study. Collectively, this might be referred to as "**residual vulnerability**".

6.4.3 CONCLUSIONS

Returning to Research Question 1, there are a number of factors that inform residents' declared vulnerabilities from social-centric constructions; these are summarised in Table 6.5. This section has demonstrated the influence of social norms and social experiences in shaping constructions of personal vulnerability, and the 'vulnerable other'. Furthermore, it has highlighted how these constructions can be negotiated through resources of coping.

In some cases, this analysis has provided validation for the indicators already in use for vulnerability assessment (e.g. elderly, limited mobility). However, two exceptions were identified that may require revisions to these tools. Firstly, non-home ownership is often used as a proxy indicator for financial deprivation (e.g. SFVI, Tapsell et al., 2002; Cutter et al., 2003); yet interviews with tenants suggested that rented accommodation in fact reduces the experience of vulnerability as much of the financial burden is transferred onto someone else. This finding highlights the need to look more critically at the use of financial-based indicators

in assessments of vulnerability. In the current financial climate this is even more important as young professionals are increasingly unable to purchase property, thus changing the 'make-up' of social groups turning to rental agreements. This observation demonstrates the aging nature of indicators and importance of developing such tools in a socially-relevant way (see BBC Great British class survey; Savage et al., 2013). Secondly, previous flood experience is often regarded as an indicator for resilience, related to increased awareness of flooding and preparedness (e.g. Thrush et al., 2005), yet this research showed that it can result in heightened feelings of vulnerability and diminished views on abilities to cope. This observation emphasises the importance of the application of phase-sensitive indicators. Indeed, whilst previous flood experience may be regarded as beneficial in the preparation and response phase of flooding, this study suggests that it is potential detrimental to recovery on an emotional level.

A key finding has been the importance of understanding constructions of the 'vulnerable other' and the influence of this upon constructions of the self as potentially vulnerable. Whilst it is clear that appraisals of self-vulnerability often appear to be constructed *relative* to the 'vulnerable other', it is not readily apparent why this seems to occur. The possible reasons for this are now examined.

Table 6.5: Reasons for self-declared vulnerabilities; observed in Bradford and IOW studies

Reasons why residents consider themselves to be vulnerable	Reasons why residents do not consider themselves to be vulnerable
▪ Constraints to physical mobility related to health or physical disability	▪ Self is distinguished from constructions of the "vulnerable other" according to physical mobility
▪ Dependents – related to physical constraints (above), logistical and emotional concerns (e.g. keeping the family together)	▪ Self is distinguished from constructions of the "vulnerable other" according to aspects of resilience (e.g. access to social networks, personality traits)
▪ Flood hazard creates vulnerability either during (i.e. threat to personal safety) or after the flood (i.e. logistical concerns such as access to alternative accommodation and repairs to property; ad emotional impact) ▪ Diminished resilience ▪ Financial concerns	▪ Acquired resilience (e.g. through flood experience)

6.5 EMERGENCE OF THE "VULNERABLE OTHER"

Throughout this chapter observations have been made about the apparent construct of the 'vulnerable other'. During the interviews residents were asked to consider who they might consider to be vulnerable and were thus, to some extent, encouraged to talk about 'the other'. However, it was also clear from the analysis of these interviews that the majority of residents tended to articulate their responses regarding personal vulnerability in relation to a so-called *other*, either associating or dissociating themselves from this illusionary or real individual. This chapter has mentioned several ways in which the 'vulnerable other' is identified in resident interviews;

- **The 'vulnerable other' spatially identified** – visual (symbolic) markers shape subjective boundaries of flooding and vulnerability on the landscape.

- **The 'vulnerable other' temporally identified** – awareness of flood histories and frequency of flooding enables some residents to position vulnerability in time, so that it belongs to a past self or past others, or belongs to future self or future others.

- **The 'vulnerable other' socially identified** – certain socio-demographic characteristics are used to identify the 'vulnerable other'; these may be based on normative values or previous experiences.

Existing research has documented the role played by "significant others" (e.g. spouse, peers) in shaping social norms and preparedness behaviour (McIvor and Paton, 2007; Chapter 2). This study draws attention to the influence of the "vulnerable other", who is most cases appears to be an illusionary construct, yet is significant for understanding residents' constructions of personal vulnerability. ***"Othering"* is described here as a process of dissociating 'the self' from the construct of the "vulnerable other", such that vulnerability is *distanced* or *removed* from 'the self'.** It is important to consider the reasons why some residents dissociate themselves from the condition or prospect of vulnerability, especially in cases where these residents might be objectively identified as vulnerable (either by their location or socio-demographic characteristics). A possible explanation connects this finding with the existential insecurities articulated by these residents. Insecurity can be approached from a symbolic sense and understood in the context on ***ontological security*** (Giddens, 1991). Giddens argues that

ontological security is a desired state towards which humans are fundamentally driven and is achieved through experiences and emotional stability that enable people to assign meaning to their lives. Ontological insecurity results when something occurs to challenge previously held meaning, thus introducing doubt and anxiety. This theory has previously been examined in the context of risk perception and used to account for seemingly 'maladaptive' behaviours, such as risk denial and avoidance of household mitigation measures (Harries, 2008; see Chapter 2). In fact, Harries (2008) argues that this fundamental need for ontological security can override the need to protect physical security. However, this has yet to be examined in the context of appraisals of vulnerability to flooding.

Based on the evidence presented in this chapter, it could be argued that distinguishing the self from a 'vulnerable other' reflects a deeper coping strategy to preserve ontological security. Apparent across interviews in both study sites is the *relative* nature of constructions of self-vulnerability, based on observations of similarities and differences between people (social-centric) and place (hazard-centric). In the context of human psychology literature, it could be argued that these observations reflect a coping process which enables individuals to *distance* themselves from the discomforting aspects of risk and vulnerability; thereby minimising ontology insecurity.

Othering is a process that has been documented in psychology and is described as a coping mechanism that enables individuals to detach themselves completely from the source of threat. *Othering theory* originates from research concerning minority social groups and is thus often discussed in the context of marginalisation, social exclusion and power relations that result in the domination and subordination of certain social groups over the other (Shapiro, 2008: Johnson et al., 2004; Pearce, 2004). The impact of this process has been widely documented in social science, health research and human geography, and also examined in the context of identity (Weise, 1995; Ryan, 2007) and coping (Shapiro, 2008). It is in these latter two contexts where othering may be applicable to this research, as a potential strategy for removing "fear to the self" (Shapiro, 2008: Gilman, 1985). In this sense, othering can be linked back to Giddens and regarded as a strategy to preserve ontological security. In contrast to these perspectives on othering, in this research it is acknowledged that partial-othering may occur where vulnerability (or risk more broadly) is distanced from the self, but not removed altogether.

To determine the extent to which othering is attributable to pursuits of ontological security, there is a need to examine the evidence that suggests that dissociation is consciously (or sub-consciously) driven by residents' desire to avoid the distressing connotations of vulnerability. These are difficult theories to prove. Dissociations were observed, particularly in binary constructions whereby the participant described distinct boundaries between themselves and the 'vulnerable other'. References were made by participants to existential securities and insecurities, which lends support to this theory that dissociation from the "vulnerable other" is at least partially-driven in some residents by existential motivations.

Also documented in this study, is the influence of other variables driving this process of othering; such as the lack of personal flood experience, the "availability bias" emergent in those with local flood knowledge and the "levee bias" (applicable to Bradford study only). Whilst it is clear that the majority of residents *other* risk and/or vulnerability and regard it as condition belonging to a 'vulnerable other'; the search for ontological security is only one possible explanation. *Othering* tendencies emerge in all types of residents, across different categories of exposure to flooding, experience and socio-demographic groups. Arguably, the most important observation is that these tendencies emerge amongst those who have *experienced* flooding in the past and amongst those objectively identified as exposed to flooding. With regards to hazard-centric constructions, the influence of spatial and temporal othering means that these residents do not regard themselves as at-risk or vulnerable to flooding, which presents a challenge for risk communication and awareness-raising activities (developed further in Chapter 9).

The tendency for residents to 'mark' differences, and relate to these differences over similarities, is an important finding. Other authors have similarly emphasised how observations of difference are essential for informing and maintaining positive self-identities (Erikson, 1959; Shapiro, 2008). Furthermore, the influence of "similar others" on self-efficacy has also been documented (e.g. Bandura, 1982). In terms of designing strategies for raising risk awareness, there is a need to consider how similarities and differences across people and place are communicated. The ultimate goal should be to minimise points of difference and emphasise a shared identity. At a time where householders are encouraged to embrace responsibility in managing the risk to their property, there is clearly a need for that risk and the potential to be vulnerable, to be acknowledged. Although quantitative analysis in Chapter 5 showed favourable attitudes towards responsibility in general, qualitative analysis has shown that the

transference of risk and vulnerability onto others seems to reduce these residents' willingness to embrace options for property mitigation (as observed by others, e.g. Flynn et al., 1999). Related to this, were attitudes concerning social justice and notions of "learned helplessness", i.e. a lack of personal control (discussed in Section 6.3.2). Returning to the notion of "insiderness" introduced in Chapter 2, this chapter now examines how the findings observed so far may be aligned to this gradient.

6.6 EXAMINING HOW CONSTRUCTIONS OF VULNERABILITY VARY ACROSS GRADIENTS OF "INSIDERNESS"

This chapter has thus far presented the different types of constructions of vulnerability and underlining factors shaping these constructions amongst residents interviewed for this research, crucial for answering Research Question 1. The discussion now turns to the third research question of this thesis;

> **RQ3**:- Is it possible to infer degrees of "insiderness" and define insider-outsider boundaries amongst research participants? To what degree does *insiderness* influence constructions of vulnerability and declarations of vulnerability? Can these be aligned to the etic-emic spectrum?

"Insiders" are assumed to be those closest to the issue at hand and able to offer insights into the *lived experience* of the studied phenomenon (Section 2.4.2). Therefore, "insiderness" is understood as a *conceptual gradient of proximity* between the research participant and the experience of flooding and flood vulnerability. This idea derives from the assumption that while some participants will be 'close' to the topic, others will be 'distanced' from the discussion; in turn, this may influence a participant's perspective and the nature of the response shared with the researcher. Therefore, "insiderness" is developed in this section as a potential explanatory variable to clarify and explain the observed variations in declared vulnerability and types of constructions encountered in this research. This section begins by addressing the challenge of developing a suitable method for assessing "insiderness" and considers how insider-outside boundaries may be identified between the participants sampled for this research.

6.6.1 DETERMINING THE BOUNDARIES OF INSIDERNESS

In Chapter 2, it was argued that there is a need to consider critically the 'insiderness' of research participants; however, determining "insiderness" is problematic. Not only are there

several axes that might be considered, but each axis may be approached objectively by the researcher, or informed by the subjectivities of the research participants. Rather than decide on one over the other, or combine objective and subjective perspectives into one method; this section presents two methods for determining 'insiderness', based on the same axes, but approached objectively or subjectively. On the basis of the literature review (Chapter 2) and in-depth qualitative analysis, Figure 6.3 presents three key axes that appear to be important for assessing participants' level of 'insiderness'. Within this conceptual space, participants may be described as insiders, informed-insiders, informed-outsiders or outsiders[49]. This "**insiderness cube**" is applied in this study as a coding device to facilitate comparisons across participants. **The primary objective of this cube is to examine the notion of insiderness as a potential explanatory variable for observed variations in declared vulnerability**. In addition, the potential influence of insiderness upon other reported findings in this chapter is also examined; namely the different types of constructions of vulnerability and the emergence of *othering*.

Firstly, 'insiderness' can be assessed in terms of the participant's **exposure** to flooding. Objectively, this can be measured from scientific flood modelling and based on whether the participant is located within an area exposed to flooding. Arguably the terms of 'informed-insider/outsider' are inappropriate in this context. Instead, the chosen classification system captures the 'borderline' properties, within the boundaries of moderate (1 in 50 year event) and infrequent (1 in 100 year or 200 year events) flooding (as described in Chapter 4); these are described as 'borderline insiders' and 'borderline outsiders', respectively. In contrast participants located in properties within the boundaries of frequent flood events are referred to as 'insiders'; whereas, those located beyond the boundaries for all possible flood scenarios are referred to as 'outsiders'. Alternatively, this axis can be approached subjectively, according to participants' constructions of risk and the degree to which these residents viewed their personal risk of flooding (i.e. subjective exposure to flooding).

Secondly, 'insiderness' can be assessed in terms of **flood experience**. This can be determined from the interview and coded by the researcher using the 'experience typology' presented in Chapter 4 (Figure 4.6). However, as highlighted in a few interviews, flood experience can be somewhat subjective; indeed, even when water has entered the property, the encounter may

[49] Notice that these terms echo the language presented in Chapter 2 in terms of etic, informed-etic, informed-emic and emic research; to maintain the consistency in language and emphasise the gradient, rather than binary distinction, between insiders and outsiders.

not register as a flood or a significant experience from the participant's perspective. Therefore, this axis can also be approached subjectively and informed by the significance the participant attaches to the experience.

Finally, **flood awareness** represents the third axis for assessing 'insiderness'. This axis examines the extent to which the participant is aware of local flood matters. The researcher can examine this in terms of the level of detail provided and knowledge of single or multiple flood events. Subjectively, this axis considers a participant's degree of confidence and personal belief in the validity of their knowledge. This can be assessed from explicit statements, such as "*I really didn't pay attention*", "*I don't take much notice*" and "*I really don't know*"; these were evident in several interviews and illustrate cases where the participant consciously reflects on the limitations of their knowledge and 'distance' from flooding.

As well as distinguishing between objective and subjective methods for determining 'insiderness', assessments also needed to distinguish the different types of flooding. Pluvial flooding is the focus of 'insiderness' in the Isle of Wight study, as no residents were sampled within the tidal floodplain. However, in the Bradford study residents are exposed to fluvial and/or pluvial flooding; thus this distinction is also made in the assessment of insiderness.

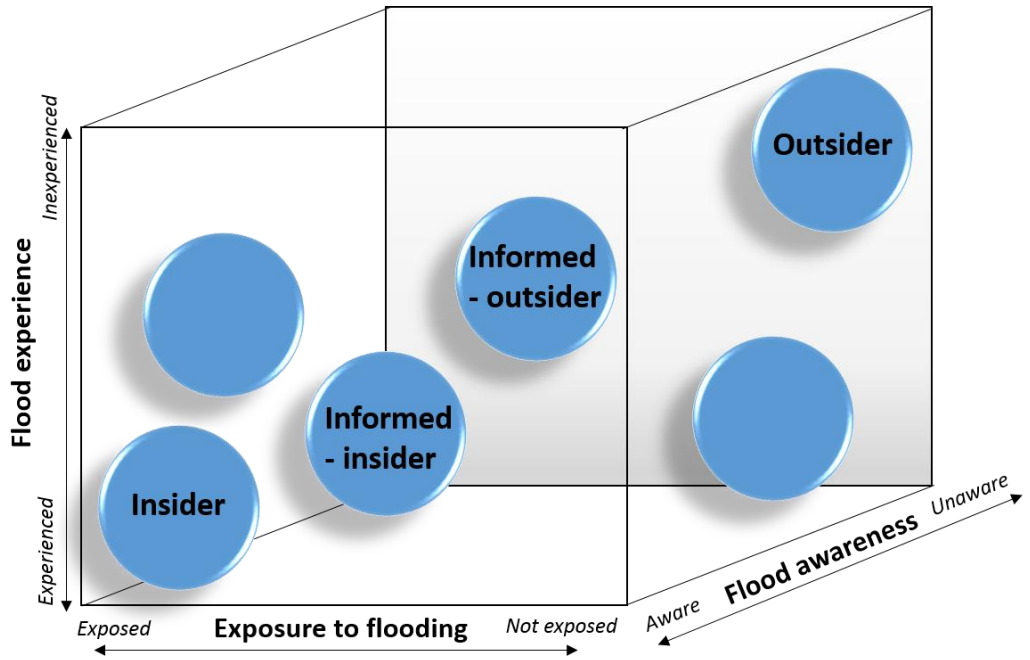


Figure 6.3: "Insiderness cube": a 3-dimensional conceptual space for representing the "*insiderness*" of resident participants.

There are a number of challenges present when trying to categorise and align participants across this gradient of 'insiderness'. These challenges have been discussed throughout this chapter and are summarised below;

- Each axis can be approached 'objectively' by the researcher or based on the subjectivities of the participants themselves; moreover, these two perspectives may be at-odds with one another

- Participants may draw from subjective views, whilst also acknowledging objective science (e.g. they may feel that they are not at risk of flooding, but recognise that their property is located within an at-risk defined area)

- Tendencies towards "spatial othering" in certain residents, show that some people actively distance or dissociate themselves from flooding (risk and vulnerability). This might be described as *self-elected "outsiderness*".

In this research, 'insiderness' was assessed both from an **objective and subjective perspective**, and guided through a series of prompts in a decision tree (Appendix B). Although participants were not consciously asked to reflect on their personal level of 'insiderness', the subjective approach is firmly rooted in the data to ensure that the final category is representative of the participant. Overall, a participant's degree of 'insiderness' depends on a combination of each of these three axes. However, whilst some participants are consistently coded as e.g. 'insiders', there are some who vary across these axes. This presents a challenge for assigning an overall category for 'insiderness', which requires an informed decision regarding the *weighting* between each axis. To address this, a scoring system was used, which assigns a score of 1 to 4 for insider to outsider, respectively. Scores were aggregated across each axis to produce an overall score and classified according to values outlined in Table 6.6. The resulting model of 'insiderness' assumes that each axis is equally important in determining 'insiderness'. A summary is presented in Tables 6.7 to 6.9 to outline the number of participants falling within each category in the Bradford and IOW studies. The extent to which insiderness predicts declared vulnerability and other patterns in research findings that might be observed between these groups, are now examined.

Table 6.6: Final scores and categories of 'insiderness'

Overall category for "insiderness"	Final score (based on summation of 3 axes)
Insider	3-4
Informed insider	5-7
Informed outsider	8-10
Outsider	11-12

Table 6.7: Number of participants within each category for 'insiderness' for FLUVIAL flooding, across the axes of exposure, awareness and experience: Based on objective and subjective perspective, Bradford case study

Insiderness: Fluvial	Exposure		Awareness		Experience		Overall Insiderness	
	Object	Subject	Object	Subject	Object	Subject	Object	Subject
Insider	17	6	14	13	12	11	13	6
Informed-insider	0	8	12	8	8	9	6	17
Informed-outsider	1	13	1	6	6	6	8	4
Outsider	9	0	0	0	1	1	0	0

Table 6.8: Number of participants within each category for 'insiderness' for PLUVIAL flooding, across the axes of exposure, awareness and experience: Based on objective and subjective perspective, Bradford case study

Insiderness: Pluvial	Exposure		Awareness		Experience		Overall Insiderness	
	Object	Subject	Object	Subject	Object	Subject	Object	Subject
Insider	19	1	0	0	0	0	0	0
Informed-insider	0	4	17	17	17	17	19	15
Informed-outsider	3	13	6	6	6	6	5	7
Outsider	5	5	1	1	1	1	0	1

Table 6.9: Number of participants within each category for 'insiderness' for PLUVIAL flooding, across the axes of exposure, awareness and experience: Based on objective and subjective perspective, Isle of Wight case study

Insiderness: Pluvial (IOW study)	Exposure		Awareness		Experience		Overall Insiderness	
	Object	Subject	Object	Subject	Object	Subject	Object	Subject
Insider	4	2	9	6	2	1	3	1
Informed-insider	1	2	2	5	10	11	9	11
Informed-outsider	4	8	1	1	0	0	0	0
Outsider	4	1	1	1	1	1	1	1

6.6.2 CONSTRUCTIONS AND DECLARATIONS OF VULNERABILITY ACROSS RESEARCH PARTICIPANTS

The previous section demonstrates that it is possible to infer different categories of "insiderness" between the residents sampled for this study. Two methods were presented for assessing insiderness objectively or subjectively; referred to here as "objective insiderness" and "subjective insiderness". This section considers the next part of the research question and critically examines the extent to which "insiderness" accounts for observed variations in declared vulnerability, as well as other interesting findings emergent from interview analysis, including;

- Hazard-centric and existential constructions of vulnerability (note: social-centric constructions evident in all groups)
- Spatial othering of risk & vulnerability
- Temporal othering of risk & vulnerability
- Social othering and tendencies towards association/dissociation from a so-called "vulnerable other"
- Constructions of risk

6.6.2.1 EXPLORING GRADIENTS OF INSIDERNESS IN THE BRADFORD CASE STUDY

Contrasting objective and subjective assessments of insiderness for *fluvial* flooding

In contrasting objective and subjective assessments of insiderness (Table 6.6), the first observation is that so-called "insiders" are more likely to consider themselves to be vulnerable if a flood were to occur than other groups across this spectrum. This finding suggests that both objective and subjective measures of insiderness towards fluvial flooding are a good explanatory variable for predicting self-declared vulnerabilities. Furthermore, existential constructions of vulnerability were concentrated in insiders (objective assessment), and insiders and informed-insiders (subjective assessment), only. This finding suggests that the construct of "feeling vulnerable" is articulated by those 'closest' to flooding; as one might expect, given that this includes those who have directly experienced or been primary witnesses to the negative consequences caused by flooding.

Social othering is evident across all groups. Objective insiderness showed that there is an equal ratio of association and partial-association, to dissociation from so-called vulnerable others, within insiders and informed-insider groups. However, only partial associations and dissociation is observed in informed-outsiders. In contrast, subjective insiderness revealed that dissociation does not occur within the insider group, but dominates informed-insiders and informed-outsiders relationship to the "vulnerable other". These findings indicate that insiderness seems to influence the degree to which social othering occurs in residents as they reflect on their potential to be vulnerable. This may be accounted for by examining the distribution of experiential and normative orientated constructions of vulnerability. Whereas constructions of vulnerability are shaped through experiences within insider and informed-insider groups (i.e. experiential constructions); informed-outsiders appear to be dominantly influenced by normative social values of who is defined as a vulnerable person. From this finding it seems that previous experiences of flooding are more likely to prompt associations with the 'vulnerable other' and increase recognition of the self as potentially vulnerable. However, evidence for *spatial othering* and *distancing vulnerability* was predominantly observed in insiders and informed-insiders (according to both assessment methods). A select number of residents within these groups also expressed the sense of a lack of control in discussions of property mitigation options, thus emphasising the importance of state-funded flood prevention (Section 6.3.2).

In terms of residents' constructions of *risk*, objective insiderness revealed evidence for temporal othering, predominantly within the "insider" group. Although there was no discernible pattern in the *distancing* or *removal* of risk from the self onto others as a result of spatial othering, the view that the area is now "risk free" (fluvial) is greatest amongst insiders. With regards to pluvial flooding, one resident was certain that this risk existed, three were uncertain and six considered there to be no risk of pluvial flooding. This latter view was also dominant within informed-insider and informed-outsider groups. Whilst attachment towards "symbolic markers" on the landscape prompting existential insecurities, were mainly expressed by insiders; equally detachment from such markers, prompting existential securities occurred *only* in this group. These findings suggest that "insiders" are more likely to reject their risk status and conceive risk as belonging to other people and places. The main reason for this, appears to be the 'levee bias' and assumption that risk has been removed from the area; when in fact, fluvial risk has been minimised and pluvial risk remains. However, in light of the existential reactions evident in this group, it might be argued that the willingness to believe

that risk has been removed, is driven by a deeper emotional reaction (such as the search for ontological security previous discussed).

In contrast, subjective insiderness revealed that temporal othering of risk is evident within insiders and informed-insiders only, but concentrated within the informed-insider group. Expressions of existential insecurities/securities towards symbolic markers appear on a gradient; with insecurities expressed by insiders, a mixture of both articulated by informed-insiders and the presence of only existential securities within the informed-outsider group. In terms of spatial othering of risk, insiders seem to merely *distance* risk from themselves, whereas informed-insiders dominantly *remove* risk and conceived the area to be "risk free". Detachment from visual markers occurs in the informed-insider group, only. With regards to pluvial flooding, the majority of participants across all groups did not consider this to be a risk. In contrast to objective insiderness, this method suggests that it "informed-insiders" are more likely to reject their risk status.

Objective and subjective assessments of insiderness highlight a pocket of insider and informed-insider residents who, whilst aware and experienced in flooding, display tendencies towards spatial othering of vulnerability and risk; arguably, in the pursuit of existential security. These processes may in fact make this group more vulnerable to future flooding.

Contrasting objective and subjective assessments of insiderness for *pluvial* flooding

Insiderness was also assessed for the Bradford study according to pluvial flooding. It is noteworthy that no residents were categorised as "insiders" using this method. Instead, objective and subjective insiderness essentially divided participants into two groups of *informed-insiders* and *informed-outsiders* (with one exception, Table 6.7). Analysis of objective insiderness showed that those who would consider themselves to be vulnerable if a flood occurred belonged to the informed-insider group and did not emerge in informed-outsiders. This distinction was less apparent in the subjective assessment of insiderness, where those declaring themselves as vulnerable appeared in both the informed-insider and informed-outsider groups. These findings suggest that, whilst objective insiderness towards pluvial flooding is a good explanatory variable for predicting self-declared vulnerabilities, subjective insiderness is not.

As observed in the fluvial assessment, objective insiderness shows how existential constructions of vulnerability are only expressed by informed-insiders. Furthermore, the greatest association with the 'vulnerable other' is seen within this group, compared to informed-outsiders who tend to dissociate themselves from this illusionary other. Somewhat contradicting this finding, spatial othering and tendencies towards distancing vulnerability were also mainly emergent in this group. Less distinct patterns are observed in the assessment of subjective insiderness, as both informed-insiders and informed-outsiders display existential constructions. Moreover, there is a minimal tendency towards dissociation from 'the other' in social-centric constructions of vulnerability, in both informed-insider and informed-outsider groups. Spatial othering also occurs in both groups.

With regards to constructions of risk, analysis of objective insiderness shows that temporal othering of risk is evidenced in informed-insiders only. Whilst spatial othering of risk is witnessed in both groups, there appears to be a slight tendency towards the 'removal' of risk amongst informed-insiders. Furthermore, analysis revealed a small number of residents who are certain or uncertain of the risk of pluvial flooding, within the informed insider group, only. However, even within this group the majority do not consider themselves to be at risk of pluvial flooding. Similarly, analysis of subjective insiderness, shows that temporal othering dominantly occurs within the *informed-insider* group, alongside tendencies towards the 'removal' of risk via spatial othering. A select number of residents who are certain or uncertain of the risk of pluvial flooding, predominantly emerge with the informed insider group, as well as two 'informed-outsiders'; however, the majority of residents sampled do not regard pluvial flooding as relevant to them. Collectively, it seems that informed-insiders are more likely to regard pluvial flooding as a possibility than those 'distanced' from flooding; however, pluvial flooding remains overlooked by the majority of residents, regardless of their level of insiderness.

6.6.2.2 EXPLORING GRADIENTS OF INSIDERNESS IN THE ISLE OF WIGHT CASE STUDY

The assessments of insiderness for pluvial flooding in the IOW study showed no "informed-outsiders", thus the categories include insiders, informed-insiders and outsiders only (Table 6.8). Firstly, there was no discernible pattern in declared vulnerabilities between these categories, indicating that insiderness is a poor explanatory variable.

In contrasting objective and subjective insiderness, analysis yielded very similar results. Firstly, the small number of participants expressing existential constructions of vulnerability were all defined as informed-insiders. Secondly, the tendency to *spatially other* vulnerability predominantly occurred in informed-insiders (though was also reported in the individual "outsider"). Here, it seems that these residents spatially distance vulnerability, thus reducing estimates of their personal vulnerability; even though a couple of these residents are (objectively) exposed to pluvial flooding. Interestingly, evidence for existential insecurities towards visual (or "symbolic") markers, predominantly emerged within insider and informed-insider residents. Whilst this finding might suggest that spatial othering is linked to existential insecurities, these findings were observed in different participants within this group. Overall, spatial othering leading to the 'removal' of *risk*, was evidenced across all groups. A limited number of insiders and informed-insiders felt certain that pluvial flooding was a risk, or were unsure about whether it would affect them. However, the majority of residents in all groups felt that there was no risk of pluvial flooding. This directly contradicts scientific modelling in this area which suggests otherwise.

With regards to social othering, the assessment of objective insiderness revealed a tendency for insider and informed-insider residents to dissociate themselves from constructs of the 'vulnerable other'. Similarly, subjective insiderness showed that dissociation dominantly occurs within the informed-insider group, with associations expressed by the individual insider and outsider in this sample. The prevalence of dissociation, may reflect the lack of direct flood experiences amongst the Isle of Wight sample and reliance upon more normative-informed constructions of the 'vulnerable other'.

6.6.2.3 STRENGTHS AND LIMITATIONS OF "INSIDERNESS"

The notion of "insiderness" removes the binary outsider-insider distinction often made between researchers and research participants. Instead, this approach argues that it is inappropriate to think of participants as a homogeneous group of "insiders" as, understandably, each person will vary in their experience and insight to the research topic. Taking this another step forward, this section hypothesised that "insiderness" might be an explanatory variable that accounts for observed differences in the declarations and constructions of vulnerability.

The methods for assessing insiderness via objective and subjective lenses, provides a means of examining the cumulative effect of exposure, experience and awareness, which were all shown to be relevant in this analysis (and existing research reviewed in Chapter 2). Although this research sought to examine the cumulative effect of these axes, which arguably masks the contributions of each axis; it is still possible to assess and examine insiderness across each axis individually. In contrast to traditional approaches for examining vulnerability, this approach considers the different *perspectives* of those sampled, rather than simply relying on their socio-demographic characteristics. Moreover, the conceptual notion of insiderness, highlights how people can transition across this gradient and how states of insiderness can evolve through time. Moreover, this may be influenced through interaction with 'external knowledge' (i.e. regarded 'experts', such as the EA), or potentially through interaction with 'internal knowledge' (i.e. 'insiders' within the community).

However, there are a number of limitations to this strategy. Currently, insiderness is calculated in both approaches by an additive model which equally-weights each axis and therefore makes the assumption that each is equally important in governing insiderness. Whilst this method could be easily adjusted to apply a weighting scheme, this was not researched in this study. Furthermore, although the subjective method for assessing insiderness is rooted in the data as far as possible, participants themselves were not directly asked to reflect upon their degree of insiderness and how they might align themselves across this gradient. Both of these limitations warrant further research and may yield different insights into the explanatory power of insiderness.

6.7 CONCLUSIONS & IMPLICATIONS

Returning to Research Question one, this study has documented evidence for three main constructions of vulnerability, informing residents' evaluations of personal vulnerability and the vulnerability of others. These construction-types are not necessarily mutually exclusive, but often mutually-informative and are described here as *hazard-centric, social-centric* and *existential* constructions of vulnerability. Analysis has shown that there exist a number of variables influencing these constructions and self-declared vulnerabilities amongst the residents sampled in the selected case studies. This has included discussions of attachment/detachment to visual ("symbolic") markers of the landscape, hazard

characteristics, socio-demographic characteristics associated with the ability to respond and recover, as well as resources for coping.

A central finding is that residents tend to appraise personal vulnerability in relation to a real or illusionary "vulnerable other", who may be identified spatially, temporally, socially or existentially. Depending on whether residents *associate* or *dissociate* themselves from this "other", estimates of personal vulnerability are heightened or lessened, as residents *distance* or *remove* vulnerability from the self. In part, this appears to be motivated by the need to preserve ontological security, which is seemingly threatened by personal experiences of flooding or vicariously from witnessing the impact of flooding on others. This study thus contributes to existing research, which has also documented the influence of this process in the context of risk perception (Harries, 2008). Importantly, *othering* is observed in the context of risk *and* vulnerability, amongst residents who are objectively exposed to flooding.

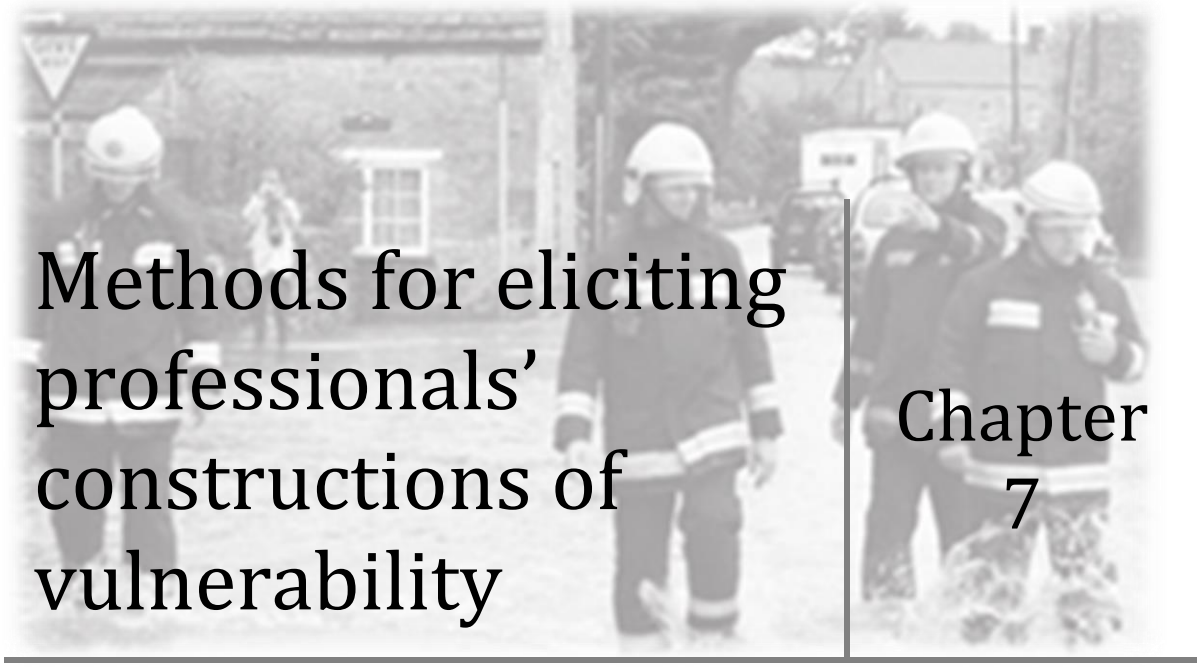
In examining "insiderness", analysis revealed that existential constructions of vulnerability and othering processes are predominantly evident amongst identified "insiders" and "informed-insiders". Interestingly, this group are more knowledgeable about flooding, yet reject it as no longer relevant to them. From an etic ("outsiders") standpoint, this may heighten vulnerability to flooding. At the same time, it is recognised that othering may be an inevitable process occurring within insider-orientated groups and motivated by ontological security. Whilst this may create a barrier to strategies for enhancing household resilience in FRM, it could also serve as an opportunity for tailoring risk and vulnerability communication in a way that emphasises *controllability* (drawing back to observations made in Section 6.3.2). Whilst it is not desired that the public should feel vulnerable to flooding, arguably there is a need for residents to *acknowledge* their potential to be vulnerable; especially in light of existing research, which has shown that acceptance of personal vulnerability is important for adopting precautionary behaviours to the threat of natural hazards (Weinstein and Lyon, 1999).

As an explanatory variable for declared vulnerability, insiderness was a fairly good predictor in the Bradford study, but considerably poor in the IOW study. Here, the majority of residents sampled did not consider themselves to be at risk of flooding and often dissociated from constructs of the "vulnerable other" (regardless of insiderness). This finding may be explained in the context of the "availability bias", attributed to a lack of personal experience amongst participants and normalisation of flooding in areas frequently flooded (confirming existing

research; e.g. Mileti and O'Brien, 1993; Haynes et al., 2008). Arguably, this is reflected in the lack of participation amongst residents in this location. This raises important implications for raising risk awareness and motivating participation in FRM activities. Moreover, regardless of insiderness, the majority of those interviewed in both study areas did not consider pluvial flooding to be relevant to them, contrary to scientific modelling which suggests otherwise. It is clear that pluvial flooding presents a unique communication challenge.

The "insiderness cube" is a helpful conceptual tool. Residents can be thought of as moving fluidly within this space of "insiderness", such that interaction with external (e.g. Environment Agency) or internal knowledge (e.g. others within this space) can alter a person's degree of insiderness. This concept could be used to guide future FRM activities. On one hand, it is clearly desirable that people residing in areas prone to flooding should be informed-insiders and aware of the nature of this risk. However, ontological insecurity (and associated othering) may result from increased awareness. It is crucial that participatory activities in FRM engage this and consider the tension that may result between "insider" and "outsider experts", as well as the resonance and impact of insider/outsider voices. This is unpicked further in Chapter 9.

This thesis now turns to the second phase of the research design outlined in Chapter 4 and examines how vulnerability is constructed and represented from the perspective of *emergency professionals*. These insights will be juxtaposed with those presented here in Chapter 9, which returns to the notion of an etic-emic spectrum and evaluate the extent to which these findings may be aligned across an insider-outsider gradient.



Methods for eliciting professionals' constructions of vulnerability

Chapter 7

CONTENTS

7.1 INTRODUCTION

This thesis aims to examine the extent to which constructions of vulnerability can be understood in terms of an etic-emic gradient. To this point, this has been examined within academia (Chapter 2) and in two communities at risk of flooding (Chapter 5 & 6). The discussion now turns to the perspectives of Category One Responders, who have a professional responsibility to identify and act upon vulnerability (as outlined in Chapter 3). This chapter outlines the methodology for eliciting the perspectives of emergency professionals involved in Flood Incident Management (FIM), to address Research Questions 2 and 3:

> **RQ2**: How is vulnerability constructed by emergency professionals? How do these constructions shape identities of vulnerability and professionals' expectations of people's ability to respond and recover from flooding?
>
> **RQ3**: Is it possible to infer degrees of "insiderness" and define insider-outsider boundaries amongst research participants? To what degree does *insiderness* influence constructions of vulnerability? Can these be aligned to the etic-emic spectrum?

It is acknowledged that the unifying label of 'professionals' envelopes a diversity of knowledge and professional domains, and institutional frameworks; and a space that might be more appropriately thought of as a complex web of multiple and multi-layered interactions between a range of actors (Alexander et al., 2013; Morss et al., 2005). A multi-staged approach is used to elicit professional constructions of vulnerability and understand the professional context in which these are embedded; this included content analysis of professional literature, semi-structured interviews and cognitive interviews facilitated by a GIS-based flood risk assessment tool, "KEEPER". These stages are outlined in Figure 7.1 and are sequentially addressed in this chapter. Analysis is presented in Chapter 8, which unravels these professional constructions of vulnerability and the influence of "insiderness". These insights are then juxtaposed with those emergent from the interaction with residents in at-risk communities to demonstrate the etic-emic gradient in vulnerability thinking (Chapter 9).

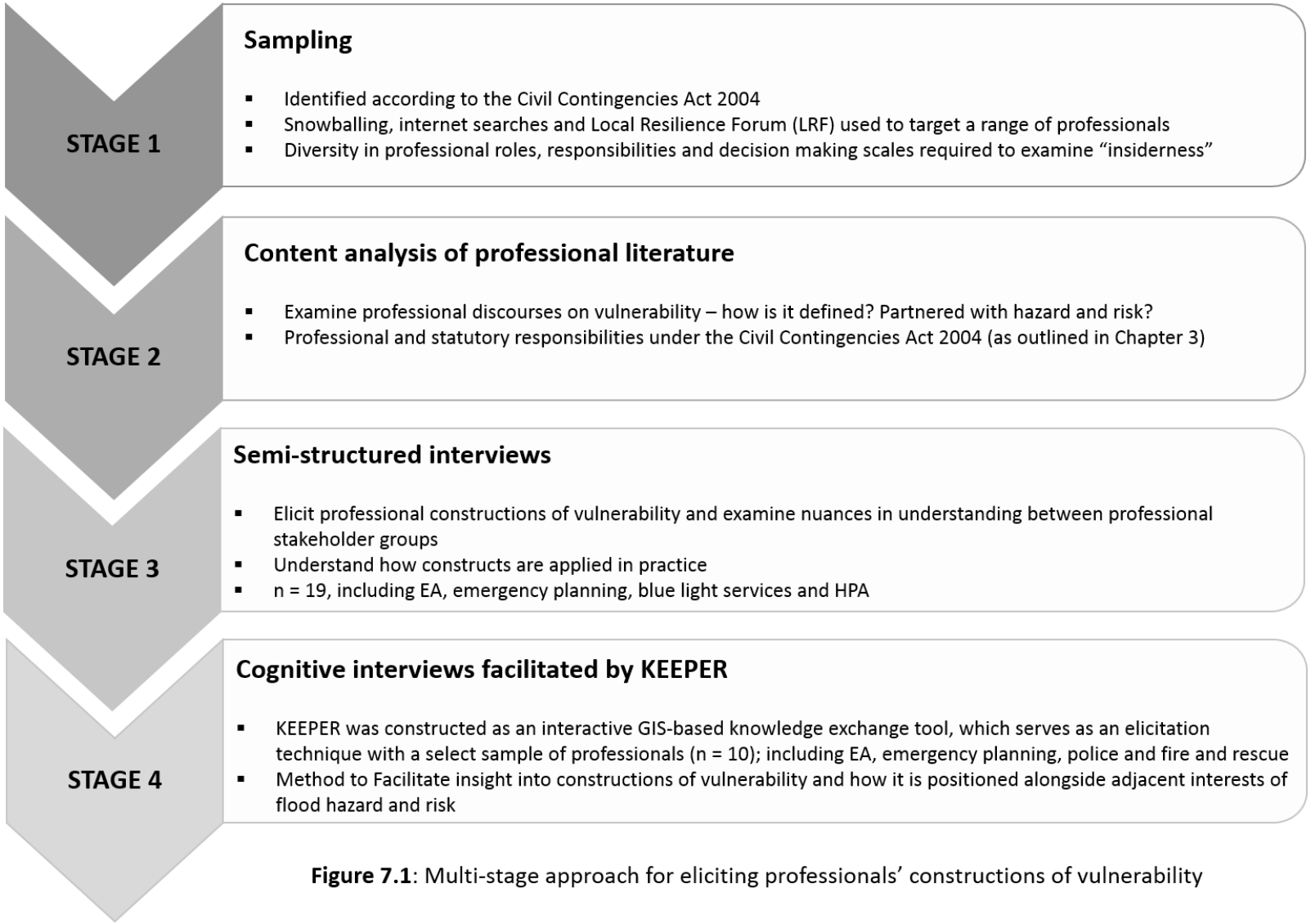


Figure 7.1: Multi-stage approach for eliciting professionals' constructions of vulnerability

7.2 STAGE 1: SAMPLING

As outlined in Chapter 3, Flood Incident Management (FIM) can be conceptualised as a complex space of professional roles, responsibilities, different spatial and temporal scales of decision making, and multiple pathways for communication (Faulkner et al., 2013). This complex operational space can be reconceptualised according to the etic-emic distinction presented in Chapter 2 and professionals can be thought of as operating at different *distances* from flooding and flood-related matters, such as vulnerability. These conceptual distances are defined in this research according to how vulnerability is identified, assessed and acted upon ("observation and action"), and the scale at which decisions are made (Figure 7.2). This research adopts the starting position that, whereas some professionals work closely with members of the public experiencing vulnerability and can offer greater insight into the "insiders" perspective (e.g. operational responders); others are distanced from this and must make strategic decisions concerning patterns of vulnerability. Given the aim of this research to examine constructions of vulnerability across this etic-emic gradient, *range sampling* was used to target a diversity of emergency professionals (Mason, 1996). This strategy was selected to facilitate comparisons and examine the similarities and differences in constructions of vulnerability, both between and within professional groups operating at different decision making scales and with different degrees of "*insiderness*". Although emergency management involves other voluntary and private sector actors, this research is focused only on the actors with a statutory responsibility (as identified under the CCA, 2004).

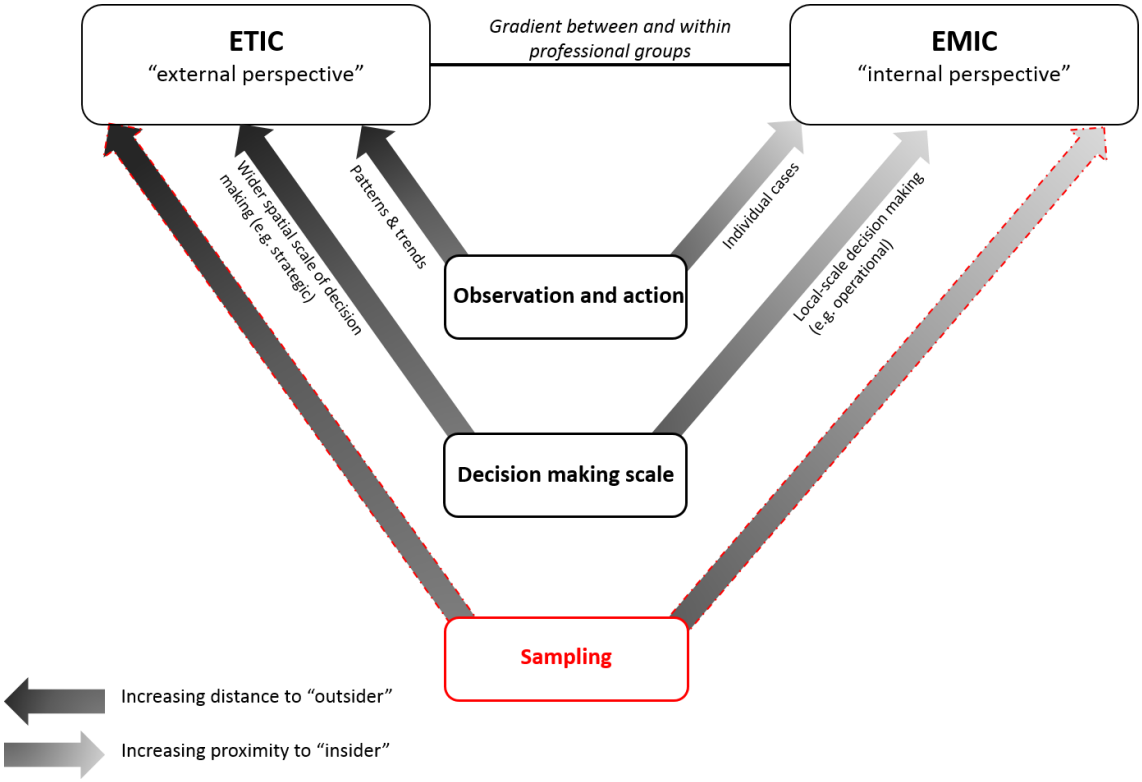


Figure 7.2: Conceptualising the operational space of emergency professionals according to an etic-emic gradient

Professionals were sampled for both study locations in the IOW and Hampshire, and West Yorkshire. While to some extent the legal framework of the Civil Contingencies Act 2004 necessitates a degree of consistency across agencies, place and local knowledge have emerged from previous research as factors influencing professional decision making (McCarthy et al., 2007). Therefore, it was decided to also examine the potential influence of these factors in this research. Professional stakeholders were targeted from internet searches, contact with the Local Resilience Forums (LRF) for these counties, and via snowballing to help foster a sense of trust and encourage participation (Valentine, 1997).

For Stage 3 of this research, semi-structured interviews were conducted with Category One Responders, identified from the Civil Contingencies Act, 2004 (see Chapter 3: HM Government, 2004). Nineteen professionals participated in semi-structured interviews; this included representatives for the Police, Fire and Rescue, Ambulance service, Environment Agency, Emergency Management (county and district council) and the Health Protection Agency[50] (Table 7.1).

[50] Note: As from April 2013 the HPA is now part of Public Health England

Cognitive interviews for Stage 4, were facilitated by the GIS-based tool "KEEPER" and conducted with a select sample of professions (n=10), representing police, fire and rescue, the EA and emergency management departments (Table 7.2). The selected professionals all participated in Stage 3, thus it was possible to examine their knowledge contributions across each method, as well as in isolation. These participants were selected on the basis of findings from semi-structured interviews, which showed the greatest diversity of opinion and professional interest amongst these groups. A full list of participants in provided in Appendix C.

Table 7.1: Summary of professional participants for Stage 3

Professional agency	**Number of participants (n)**	
	West Yorkshire	**IOW and Hampshire**
Emergency management	1	3
Police	1	1
Fire and Rescue	4	1
Ambulance	1	1
Environment Agency	2	2
Health Protection Agency	2	0
TOTAL	**11**	**8**

Table 7.2: Summary of professional participants for Stage 4

Professional agency	**Number of participants (n)**	
	West Yorkshire	**IOW and Hampshire**
Emergency management	1	3
Police	1	1
Fire and Rescue	1	0
Environment Agency	2	1
TOTAL	**5**	**5**

Given the small sample size, it is recognised that further research is required to examine the generalizability of findings across the UK, as well as their relevance to non-UK frameworks. Nonetheless, this study promotes insight into the nuances between professional constructions of vulnerability and the underlying influential factors shaping these constructions. More

broadly, these insights contribute to the understanding of the etic-emic gradient in vulnerability thinking and the wider debate for improving the meaningfulness of vulnerability assessment.

7.3 STAGE 2: CONTENT ANALYSIS OF PROFESSIONAL LITERATURE

Professional literature was reviewed in the early stages of this research to understand the civil duties of emergency professionals (described in Chapter 3). Selected professional documents were also analysed using qualitative procedures for *content analysis* to examine how the concept of vulnerability is represented. Documents subject to contents analysis were selected on the basis of intended readership, i.e. those addressed to Category One Responders. Searchers were conducted beyond the subject matter of flooding to include other types of hazard events and emergencies more generally to facilitate comparisons and insights into how constructions of vulnerability may potentially change under different hazard etiologies. Accompanying this internet search, analysis was conducted on documents introduced by professional participants themselves during the interview process. In most cases, professionals confirmed the importance of documents already selected (e.g. HM Government, 2008), but also enabled access to documentation held internally by certain organisations.

A full list of the literature reviewed and assessed is provided in Appendix C; this included statutory and non-statutory guidance documents for emergency management (i.e. HM Government documents), and emergency planning documents (preparedness, response and recovery), written for multi-agency or individual-agency usage. It is noteworthy, that some of these publically-available documents, or documents made privately available to this research, have been 'cleaned' to remove potentially sensitive information; including information relating to vulnerability. It is understood that the information removed, mainly includes estimated counts of vulnerable people and spatially-referenced establishments which house so-called vulnerable individuals (e.g. residential care homes); and is therefore, not a limitation to this analysis. The reviewed literature are summarised in Figure 7.3.

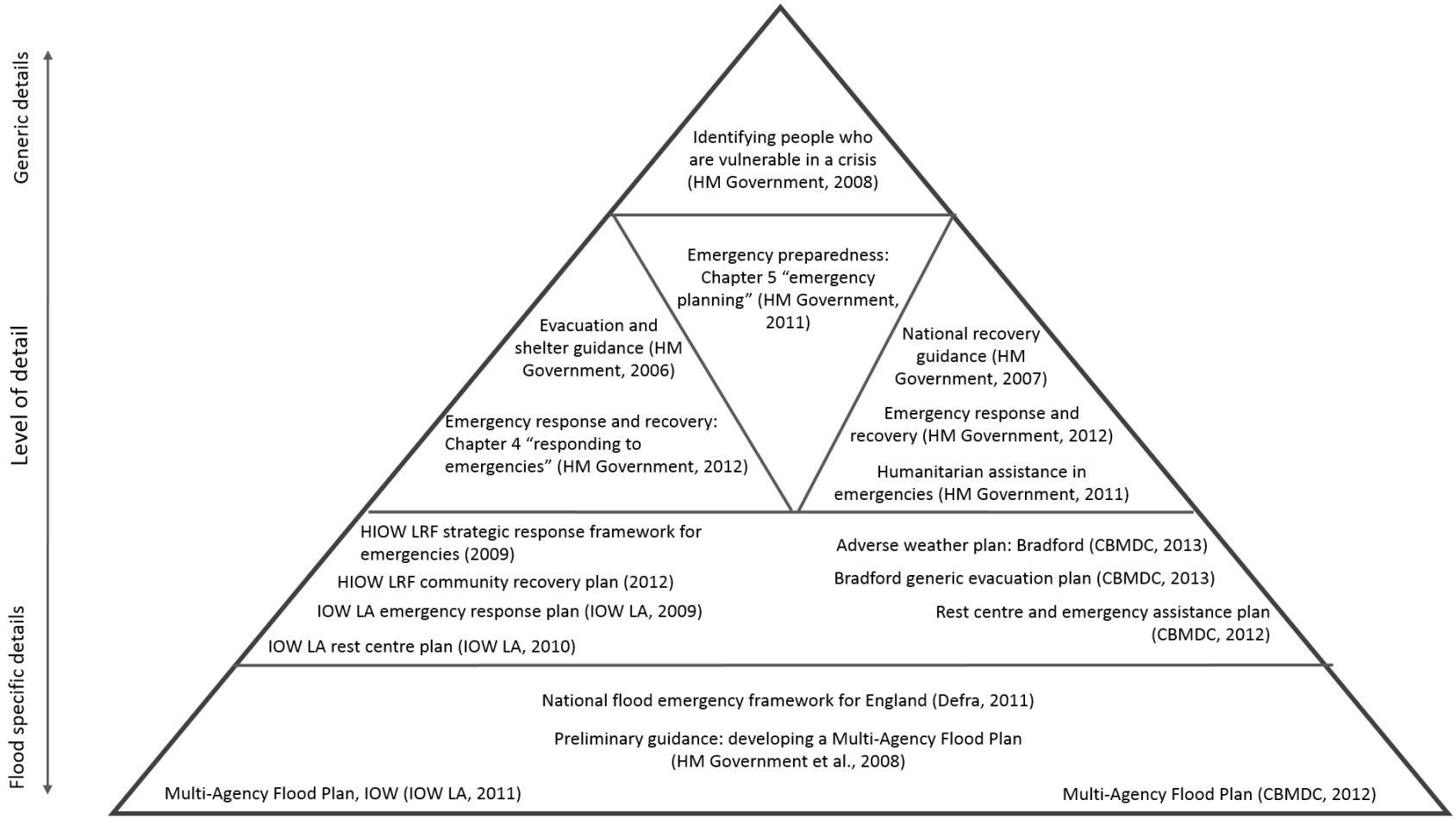


Figure 7.3: Professional documents for contents analysis

Content analysis is a method for examining the meaning (content) and the format of information, and can be applied to any form of written data. Essentially, this method abstracts and condenses text to support descriptive and interpretive analysis. This method is often applied to the study of communication sciences (e.g. analysis of news discourse; Semetko and Valkenburg, 2000); as well as nursing research (Downe-Wamboldt, 1992; Graneheim and Lundman, 2004), education (Strijbos et al., 2006), and natural hazards research (e.g. study of social media in Vieweg et al., 2010). Although content analysis was traditionally rooted in the quantitative paradigm of social science (e.g. Berelson, 1952), it has been accused of providing superficial interpretations of complex meaning and processes; in response, significant efforts have been made to study content through qualitative analytical methods (Mayring, 2000; Graneheim and Lundman, 2004).

A distinction is made between manifest and latent content (Graneheim and Lundman, ibid). Whilst both require some form of interpretation, the level of depth and abstraction is varied between manifest content analysis, concerning the visible components of text; and latent content analysis examining the underling meaning, and relationships between meaning units and context. In this research, both the manifest and latent content were examined to explore the underlying assumptions and different contexts in which vulnerability[51] is described. Each professional document was used as the unit of analysis and read several times to acquire a sense of the whole. Coding was emergent from the text and based on meaning units; defined by Graneheim and Lundman (2004) as *the constellation of words or statements that relate to the same central meaning through their content and context*. Coding informed both category and theme development[52] (see Appendix C). Overall, observations were recorded under the following headings;

- Authorship and intended reader/user of information
- Purpose of document
- Context(s) in which vulnerability is described
- Form of information (written, tables, maps, diagrams)

[51] Vulnerability was the pivotal content area studied in these documents; where *content area* refers to parts of the text that describe a particular topic (Graneheim and Lundman, 2004)
[52] In this research, categories and themes were identified for manifest and latent content, respectively; as described by Graneheim and Lundman (2004).

In conducting content analysis this second stage of research examined how vulnerability is constructed in professional documents, acknowledging that such documents are a key part of professional training. One would expect professional constructions of vulnerability to mirror those observed in this grey literature, but the extent to which this was observed was examined during Stage 3.

7.4 STAGE 3: SEMI-STRUCTURED INTERVIEWS WITH EMERGENCY PROFESSIONALS

Semi-structured interviews were conducted with emergency professionals in Stage 3 of the multi-stage approached presented in Figure 7.1 (n=19). This method was selected to ensure that all stakeholders were asked the same key questions, whilst allowing for the flexibility required in interviewing a range of professional stakeholders. Semi-structuring interviews not only ensures some degree of control with regards to the topics discussed, (essential for comparing ideas across groups), but arguably elicits openness and more realistic responses than the artificiality of a questionnaire or structured interview (Flick, 1998). An outline of this interview is provided in Appendix C.

Prior to each interview stakeholders were sent a briefing document to explain in simple terms, the nature of the research and research questions. Each interview began with a summary of this document and an explanation of the semi-structured interview technique so the interviewee was aware that he/she could ask any questions at any time and digress from the interview structure where they felt it was relevant; interviewee consent was obtained at this stage. Interviews typically lasted from 1 to 2 hours and were conducted either face-to-face or over the telephone. There are potential limitations to both these methods, such as over or under reporting and rapport-building respectively; however, the interviewer was reflexive following each interview and found there to be very little difference in the progression of the interview and the responses given. There are of course a number of challenges that may be encountered in the 'expert interview' as discussed by Meusser and Nagel (1991), indeed each of the four challenges they discuss was experienced in this research. For example, participants were selected as representatives for certain professional groups, but there were times where the interviewee switched positions from professional to private individual or sought to discuss

on-going tensions, such as climate change and the delivery (or failings) of the Pitt Review recommendations. These interviews thus required careful facilitation.

Two key objectives guided the use of interviews at this stage of research:

I. Elicit constructions of vulnerability from a range of emergency professionals in order to examine etic-emic gradients in knowledge
II. Recommendations for a GIS-based flood risk mapping tool (KEEPER) to trial with emergency professionals (in accordance with FRMRC research agenda)

Whereas the first objective was designed to address the aim of this thesis, the second objective was steered by the practically-orientated aims of the Flood Risk Management Research Consortium (FRMRC; as outlined in Section 3.5). Insights from this latter research focus are published elsewhere in Alexander et al. (2011; 2013; included with appendices). Of interest to this thesis, is the varied understanding of vulnerability amongst emergency professionals and how this is enacted in practice. Professional participants were asked to consider how they might define social vulnerability, who they might consider to be vulnerable to flooding and why. This was firstly presented as an open-question and then participants were asked to evaluate a list of socio-demographic characteristics identified from the literature and subsequently consider how interest in these characteristics might change throughout the course of a flood event (preparation, response and recovery). This exercise captured how vulnerability is characterised through various contexts. Each interview was transcribed and analysed in the qualitative analysis software NVivo. The techniques proposed through grounded theory (line-by-line and focused coding) were employed with an underlying social constructivist epistemology (Charmaz, 2006). This philosophy and practical coding strategies were outlined in depth in Chapter 4.

Although the second objective of this study is reported elsewhere, practical recommendations made by professional participants were used to inform the design of KEEPER. Whilst KEEPER was a deliverable output for FRMRC and conceived as a practical tool for trialling different forms of presentation and interactive methods for facilitating professional engagement with flood science; in the context of this thesis, KEEPER is conceived as a technological elicitation technique for examining constructions of vulnerability in more depth. The rationale for this methodological decision is now presented.

7.5 STAGE 4: COGNITIVE INTERVIEWS FACILITATED BY "KEEPER"

"KEEPER" denotes a Knowledge Exchange Exploratory tool for Professionals in Emergency Response and describes an interactive GIS-based flood risk mapping tool. This was demonstrated to a select number of professional participants, with opportunities for interaction (n = 10). For the purpose of this research, this tool was used to facilitate cognitive interviews and exploration into the constructions of vulnerability held by emergency professionals. Interviews were conducted simultaneously with the demonstration and interaction with KEEPER, and discussions transcribed and analysed in NVivo using the techniques of grounded theory (Chapter 4). Participants were also asked to complete a questionnaire. Although these questionnaires were completed to satisfy the objectives of adjacent research to this thesis (i.e. Alexander et al., 2011); the discussions that occurred during the completion of these questionnaires were also recorded and included in the qualitative analysis of this study. As this forms part of the analysis and helped guide cognitive interviews, a copy of this questionnaire is included in Appendix C.

The term 'cognitive interview' is used here to describe the process whereby participants were asked to comment on specific features of KEEPER in terms of their professional understanding and experience; and in terms of practical applicability (in accordance to the FRMRC-orientated objective of this study). This form of cognitive interview is moderated from the traditional premise of this research method, originally employed to design questionnaire surveys. Conventionally, cognitive interviews examine how respondents comprehend research questions, their personal recall strategies and their decision and response processes (Willis, 2005). Techniques for "*think aloud*" and *verbal probing* by the researcher aim to reveal the cognitive processes shaping the respondent's answers. In this research, cognitive interviews were not employed to help design a measurement instrument (i.e. questionnaire), but to elicit a conscious evaluation of the tool and constructions of vulnerability. In this light, KEEPER itself might be referred to as a method for *visual probing*.

Essentially, KEEPER constitutes a professionally-tailored equivalent to the vignettes used in Phase 1 of this research. This method could be wrongly accused of representing a positivist-form of enquiry; indeed, Sheppard (2001) challenges this attachment of positivism with quantitative geography, and the misrepresentation of GIS as a tool for positivist geographic

science (Pickles, 1995; 1997). GIS has been interpretively applied in ethnographic research to situate knowledge, and to facilitate participatory research and stakeholder engagement (Meyer et al., 2011; White et al., 2010; Leedal et al., 2010). This research similarly employs GIS in a participatory capacity to facilitate knowledge exchange and engage professionals with flood science.

Interactive visualisation is a key part of KEEPER and has been widely evaluated in cartography and flood science (e.g. MacEachren et al., 2005; Faulkner et al., 2013; Alexander et al., 2013). On one hand, visualisation can be conceptualised as a tool for supporting *visual* communication, communicating what is known and transferring this information to the end-user. On the other, visualisation can be regarded as a prompt for *visual thinking,* stimulating insight into the *unknowns* and exciting creativity (MacEachren, 2001). Just as the paradigm shift in communication theory blurs the distinction between knowledge-producer and knowledge-user (Callon, 1999: Vogel et al., 2007), this shifting paradigm in cartography similarly recognises the active contribution of the map-user that can be fostered through interactive visualisation (Alexander et al., 2013). In this research, KEEPER was created to prompt *visual thinking*. Through introducing new and existing mapping techniques concurrently, and asking participants to consciously evaluate these in turn (i.e. cognitive interview), the researcher hoped to build upon and enrich insights from Stage 3. Moreover, hazard and vulnerability maps are already somewhat familiar (to varying degrees) to emergency professionals, further justifying the use of a technological tool as an elicitation technique.

KEEPER was designed with three separate interfaces, isolating hazard, vulnerability and a combined-risk assessment. The individual features of the tool are outlined in Table 7.3 and a comprehensive description of each feature is provided in Appendix C[53]. Each Interface to KEEPER facilitated different interview themes, which were analysed both in isolation and collectively to understand professionals' constructions of flood vulnerability (summarised in Table 7.4).

[53] See enclosed CD for a demonstration of the tool, "KEEPER"

Table 7.3: Features in KEEPER (from Alexander et al., 2013)

The Hazard Interface	The Vulnerability Interface
1) The user can map the flood extent from a range of scenarios based on pluvial event matrices developed within FRMRC (Allitt et al., 2009; Chen et al., 2010). Additional fluvial scenarios were included in the Bradford version of this tool (levee breach and overbanking). 2) The user can recolor map according to depth-velocity interaction, based on expert-declared thresholds (based on Risk to Life; Priest et al., 2007). The user can manipulate these thresholds and adjust the hazard classification. Recoloring was set to a RAG (red, amber, green) scheme, based on interviews. 3) 'Clean' the map to view flood hazard posed to the road network (based on depth-velocity thresholds from Risk to Life modelling) and/or property only (based on risk to life or depth-damage thresholds (Penning-Rowsell et al., 2010). User can further base this reading on the min/max/mean flood statistics. 4) Interactive flood animation.	1) The user can adapt the original Social Flood Vulnerability Index methodology (Tapsell et al., 2002) to view relative vulnerability according to the nation, region/district or local town. 2) View indicators in isolation with accompanying explanations. 3) Construct a vulnerability index, from user-defined indicator selection and weighting. **The Risk Interface** Collates hazard and vulnerability models at the property scale. User can define the weighting between hazard and vulnerability and automated property and people count to summarise risk categories.

Table 7.4: The role of KEEPER in cognitive interviews

Feature in KEEPER	Function in cognitive interview
Hazard Interface	Examine relationship between hazard and vulnerability in professionals' constructions and decision making
Vulnerability Interface	Elicit constructions of vulnerability; to what extent do professionals value the use of indicators? Observe how vulnerability is characterised (indicator selection) and how these characteristics are weighted. Examine reasons why indicators may be deemed unimportant.
Risk Interface	Examine how constructions of vulnerability are positioned alongside constructions for hazard and risk (e.g. weighted importance); also observations on the relationship between these constructions (synonymous, related or isolated?)
Interactive visualisation	Enable participants the opportunity to 'play', explore and articulate ideas
Adjustable spatial scales (options to zoom in and out)	Examine spatial context in constructions of vulnerability and links to scales of decision making

The hazard Interface presented professionals with a number of options for visualising flood data derived from 1D-2D flood modelling conducted for each case study location (see Chapter 3). This included options to recolour hazard maps according to depth and depth-velocity thresholds; options to base the visualisation on different flood statistics (minimum, maximum or mean) to explore uncertainty; and finally, the ability to launch and interact with flood animation. Although this aspect of visualisation was focused at the local scale, users were able to zoom out to the spatial extent of Bradford district or the Isle of Wight and visualise broad-scale flood mapping available from the UK Environment Agency. This interface was essential for exploring the relationship between hazard and vulnerability in professionals' constructions and decision making.

The vulnerability Interface was focused on the mapping of census-derived vulnerability indicators and thus enabled professionals to discuss how they would characterise a vulnerable person and the vulnerability of an area. This was explored in a number of ways. Firstly, users had the option to map and manipulate an existing 'vulnerability product[54], the Social Flood Vulnerability Index (SFVI, developed by Tapsell et al., 2002). The SFVI is based on an additive model of four indicators; the Townsend index of deprivation, elderly, lone parent households and long-term illness. Users can view the original SFVI scores (standardised to national measures of central tendency) or can adjust the SFVI scoring system to reflect *relative* vulnerability according to different geographical scales (region, district or local). This adjusts the standardisation technique within the original method, which produces a score for each variable on the basis of national measures of central tendency (i.e. z scores are calculated according to the mean and standard deviation of the national dataset); thus painting a picture of relative vulnerability across England and Wales. In KEEPER, this option enabled the researcher to examine the spatial scale at which professionals felt vulnerability should be calculated and mapped. Professionals were also able to view indicators in isolation, with accompanying expert-declared rationales. This second option further enabled the researcher to query professionals' views on the 'make up' of vulnerability.

Finally, professionals were able to construct an index for social vulnerability by simply weighting each indicator according to the relative importance in decision making (Figure 7.4). One of the recurring critiques of the index approach in the literature is the lack of a defensible

[54] "Vulnerability product" is a term used here to describe an index compiled by expert academics

weighting scheme which often results in the equal treatment of indicators (such as the SFVI; discussed in Chapter 2). Moreover, this assumption may not be readily apparent to users of the index. By enabling professionals to integrate their subjectivities on the weighting of indicators, this removes the responsibility from the objective-scientist and builds-in an inherent flexibility into the tool. Chapter 2 described the use of indicators as an etic (or informed-etic) method, supporting etic constructions of vulnerability; however, this embedded invitation for professionals to add their subjectivities has the potential to transform indicators into an informed-emic method for vulnerability assessment. The extent to which this was regarded as feasible and desirable amongst professional participants is unpicked further in Chapter 8. As an elicitation technique, this feature in KEEPER employed indicators traditionally associated with etic-orientated research, to elicit professional constructions of vulnerability (i.e. the 'insider' perspective of professionals). Although professionals are collectively assumed to be more distanced from flood vulnerability than residents in at-risk locations, Figure 7.2 acknowledged various degrees of *insiderness* amongst professional participants. Therefore, the extent to which the presentation of etic-orientated indicators is applicable to all participants was critically evaluated during the analysis of cognitive interviews.

These debates are also applicable to the Risk Interface of KEEPER, which collated hazard and vulnerability data at the property scale. This part of the tool examines how professionals negotiate the risk equation by weighting hazard and vulnerability, based on the choice of aggregation models; including an option for equal weighting or applying a minor or major weight to hazard or vulnerability (Figure 7.5). This system of selecting a weighting model (1 or 2) gives the user the flexibility to decide whether one is slightly more important or significantly more important in governing risk and these decisions were queried through cognitive interviews. Although this feature was designed to facilitate insight into constructions of risk rather than vulnerability *per se*, this section of the interview was analysed to examine how constructions of vulnerability are positioned alongside constructions for hazard and risk. Observation were made on the relationship between these constructions, whether they are regarded as synonymous, related or isolated, and how this varied between professional participants.

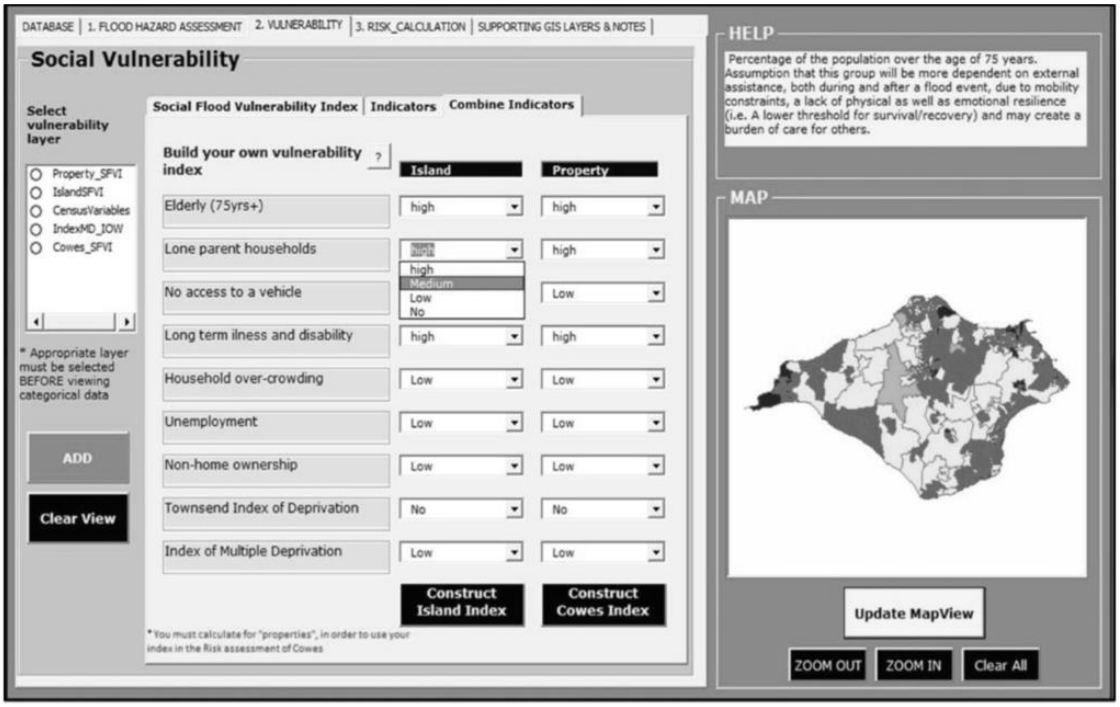


Figure 7.4: Building a vulnerability index according to user-declared relevance of each indicator (based on a sample of indicators only at this stage) (from Alexander et al., 2013)

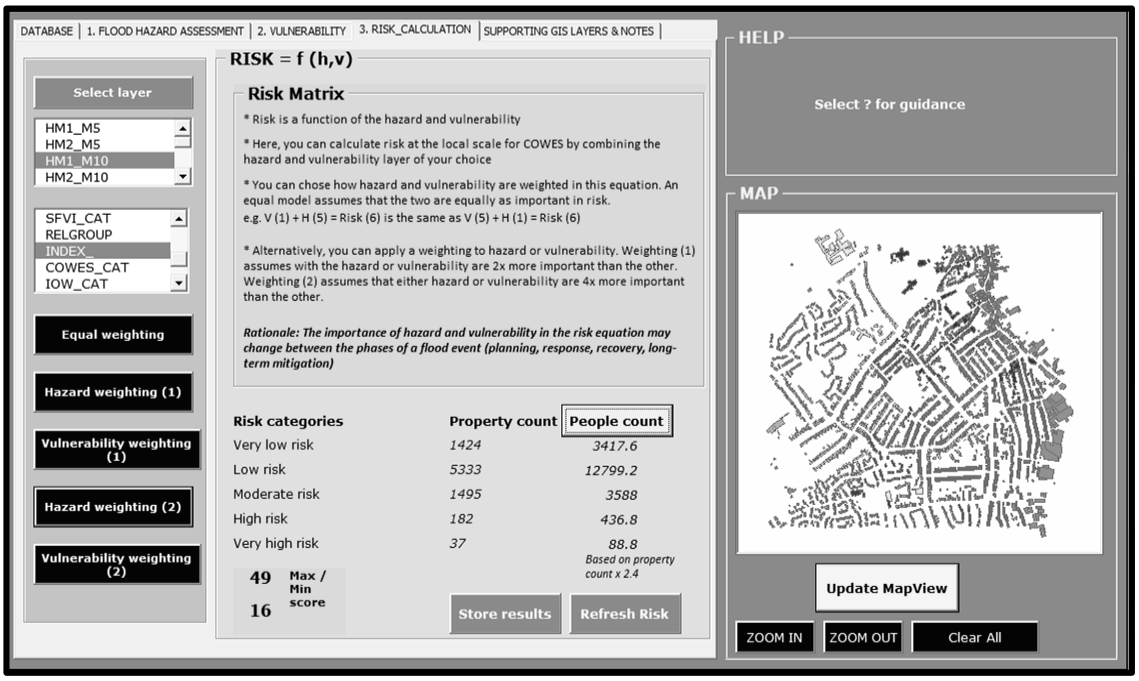
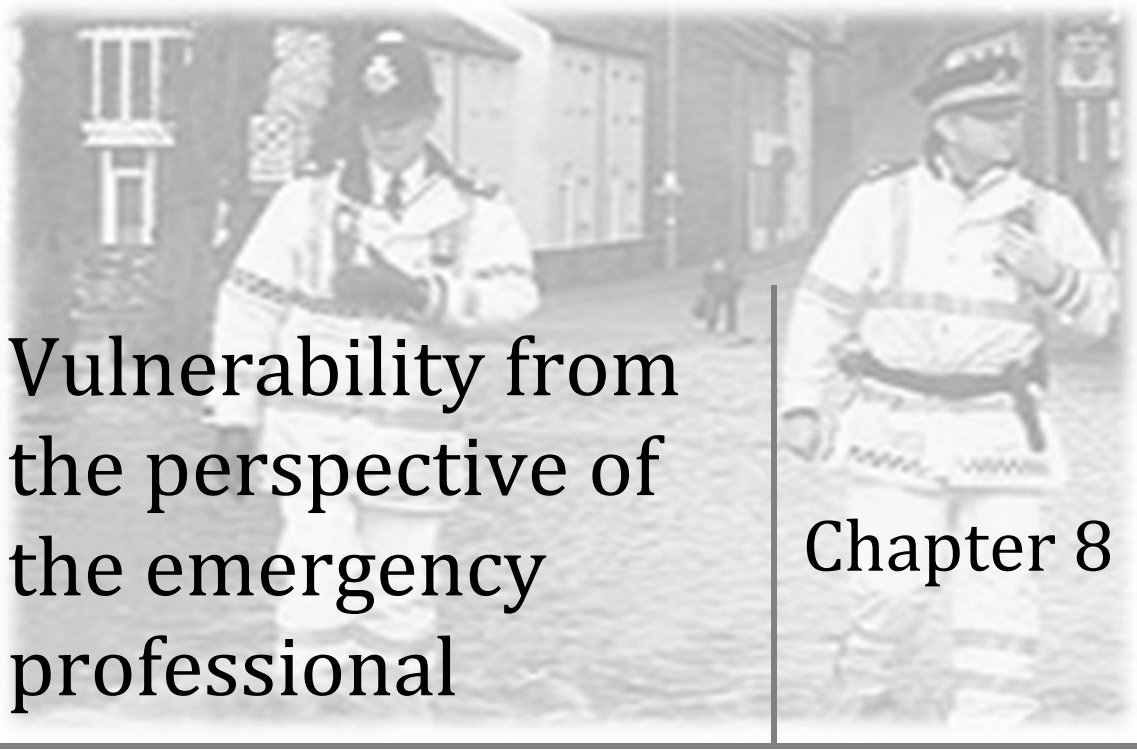


Figure 7.5: The Risk Interface of KEEPER, showing model selection (left) and automatically generated property and people counts for each category of risk.

This chapter has developed a methodology for eliciting constructions of vulnerability from the perspective of emergency professionals involved in flood incident management; including content analysis, semi-structured interviews and cognitive interviews facilitated by "KEEPER" (as outlined in the discussion above). This thesis now turns to the outcomes of data analysis and considers the implications of these findings for future research and vulnerability assessment in practice.



Vulnerability from the perspective of the emergency professional

Chapter 8

CONTENTS

8.1 INTRODUCTION

From the discussion developed in Chapter 2 and Chapter 3, it is expected that the term 'vulnerability' is contested amongst emergency professionals. Research Question 2 considers how vulnerability is constructed by emergency professionals and how these constructions in turn, shape the identities and representation of "vulnerable people". To examine this, this chapter presents the main findings from contents analysis, semi-structured interviews (n=19) and cognitive interviews (n=10) with a select sample of Category One Responders in both case study areas (as identified under the Civil Contingencies Act, 2004: HM Government, 2004). The objectives and methodology were developed and justified in Chapter 7, with supporting documents available in Appendix C.

Firstly, this chapter presents the outcomes of qualitative content analysis of statutory and non-statutory guidance documents for emergency professionals. The extent to which professionals echo these constructions of vulnerability is then examined through grounded theory analysis of semi-structured and cognitive interviews. In turn, this chapter considers how these constructions shape identities of so-called vulnerable groups, and explores professionals' expectations of certain people's ability to respond and recover from flooding (RQ2). Returning to the concept of "*insiderness*", Section 8.5 evaluates the extent to which insider-outsider boundaries may be delineated between professionals and whether resulting constructions of vulnerability can be aligned to the etic-emic spectrum presented in Chapter 2 (RQ3). These insights present a number of implications for vulnerability assessment and future research with professional participants.

8.2 REPRESENTATIONS OF VULNERABILITY IN PROFESSIONAL DISCOURSE

An initial description of the statutory and non-statutory documents available to emergency professionals, was provided in Chapter 3 to establish the contextual setting of this study. This section reports the findings from qualitative content analysis of these documents, following the method outlined in Section 7.3. A list of the reviewed materials is provided in Appendix C.

8.2.1 DISTINGUISHING "THE VULNERABLE" FROM THE GENERAL POPULATION

An important observation from the outset, is that the term 'vulnerability' is not explicitly qualified in the reviewed documents, by adjectives that might depict a specific facet of vulnerability (e.g. physical, social and economic). Broadly speaking, "social" vulnerability is the main focus of these texts, insofar as vulnerability is concerned with the susceptibility of certain social groups towards harm (e.g. physical, psychological), and their capacities to recover.

Chapter 3 described the statutory obligation for emergency professionals to identify, plan and act on the needs of so-called 'vulnerable people', defined as "*those that are less able to help themselves in the circumstances of an emergency*" (HM Government, 2008: p4). This definition was obtained from the key guidance document available to emergency planners and responders, entitled "*Identifying people who are vulnerable in a crisis*", which was the main focus for this analysis. In this document it is clear that 'vulnerable people' are distinguished from the general population according to the assessed lack of self-reliance and dependence upon others, as illustrated in the quote below.

> Plans must be able to distinguish this group from the self-reliant. While all people caught up in an emergency could be (and in some circumstances will be) defined as vulnerable due to their proximity to the event, planning and response arrangements should focus on those who are assessed as not being self-reliant and may need external assistance to become safe (HM Government, 2008: p12)

A list of defining characteristics of people or groups potentially vulnerable in a crisis situation accompanies this definition (Table 3.2). From these listed characteristics, it is clear that vulnerability is predominantly constructed in terms of physical and/or social dependency; a view which is echoed in all other documents subjected to contents analysis. An important observation is that 'vulnerable groups' are categorised fairly pragmatically from a professional standpoint, i.e. as those that will require *external assistance* during an emergency situation. Therefore, although physical impairments seem to dominate the discourse of vulnerability, other groups such as tourists and minority language speakers are also listed. In addition, these characteristics are used to inform the identification of 'vulnerable establishments'; defined as "*institution[s] housing vulnerable people during the day or at night*" (e.g. nursing homes: HM Government, 2012: p217). Interestingly, there are no references to financial characteristics of the individual or household, such as unemployment or non-home ownership. Although the

relationship between poverty and vulnerability is widely discussed in the literature (see Chapter 2), this does not appear to be relevant in this document (situated in the context of planning and response). This observation may reflect the priority to save life and dominant attention towards response and evacuation. In this context, Hampshire's Multi-Agency Flood Plan (MAFP) specifically distinguishes "medically vulnerable" people. Furthermore, the following four groups are identified in HM Government (2012), as making challenging demands on responding agencies in the context of evacuation; children and young people, faith, religious and cultural groups, elderly and the disabled. Faith, religious and cultural groups are explicitly not considered to be vulnerable *per se*, but identified because they may require special care during evacuation and shelter (e.g. translators and interpreters).

The same four groups are also discussed in the context of recovery (HM Government, 2012). However, this document looks beyond 'vulnerable groups' and considers the broader impacts of the event upon the wider community. Noticeably, in discussions of humanitarian assistance, financial support is discussed. This finding points towards potential differences in the construction of vulnerability between the different phases of the emergency management cycle (discussed in Section 8.2.5).

Although "vulnerable groups" are subsumed under the umbrella term "*vulnerability*", there is an implied distinction between those ***physically vulnerable*** and those ***socially vulnerable***. For the purpose of this analysis, these terms may be defined as follows;

- **Physical vulnerability** is identified at the susceptibility of certain social groups towards physical harm (i.e. injury or risk to life); whether related to existing characteristics or triggered from interaction with flood waters.

- **Social vulnerability** refers to socio-demographic characteristics, which may heighten the social dependence of certain groups on responding agencies and their susceptibility towards emotional or psychological harm in the aftermath of flooding.

Returning to the representation of vulnerability in HM Government (2008), the support needs of listed vulnerable groups are informed by the needs of these group in non-emergency (everyday) situations (Annex 1). From this, it is implied that vulnerability can be identified on the basis of pre-existing conditions and is to some extent, independent of the hazard. Moreover, understanding the needs of these groups within 'normal', everyday settings, is argued to be useful for informing their needs within a non-normal, emergency situation. In

turn, there is an apparent assumption that 'vulnerable groups' are known to existing service providers and agencies. This assumption underscores the strategy for networking and sharing information to identify vulnerable people during an emergency (as described in Section 3.2). Collectively, these observations portray the impression that an emergency event acts upon existing conditions or characteristics, *triggering* vulnerability but not creating it.

The emphasis on the word '*potentially*' is echoed throughout the guidance document for identifying vulnerable people and appears to be an important qualification. Although characteristics of 'vulnerable people' and their requirements in an emergency situation are listed in a series of tables in this document, the accompanying term '*potential*' appears to emphasise the view that these listed characteristics are not a guarantee of vulnerability. A recurring phrase in the reviewed literature is that the list of vulnerable groups presented "*is not intended to be exhaustive*" (e.g. HM Government, 2006). Whilst emergency planners and responders are encouraged to focus their efforts on these particular groups, equally it seems that they are encouraged to think flexibly about vulnerability. This interpretation is further supported in the statement presented in Box 8.1. This 'disclaimer' cautions responders against stereotyping and assuming that membership to so-called 'vulnerable groups' automatically corresponds to vulnerability.

BOX 8.1: 'Disclaimer' for identifying vulnerable individuals; observed in "*Identifying people who are vulnerable in a crisis"* (HM, Government, 2008: p12)

31. Being in one of these categories does not automatically denote vulnerability, and stereotyping should be avoided – whether someone is in fact vulnerable will largely depend on three things:

- **The type of emergency** – your plans must be tailored and proportionate to the risks faced by your constituent community, as identified in your local Community Risk Register (CRR).
- **The type of response required** – a response to an emergency which requires an evacuation is likely to determine a higher number of vulnerable people compared to a response which requires shelter *in situ*.
- **The availability of the support that individuals normally receive** from family/friends/cares/other social networks.

8.2.2 THE INFLUENCE OF THE "HAZARD" UPON CONSTRUCTIONS OF VULNERABILITY

Box 8.1 also reveals valuable insights into the factors that determine vulnerability from an emergency professional's perspective. In this description, it appears that vulnerability is *triggered* by three factors. The first point concerning the *type of emergency*, implies one of

two things. Firstly, the reference to emergency planning suggests that vulnerability could be triggered by poor planning (i.e. not tailored or proportionate to the risk). Secondly, it could be interpreted that the type of risk is relevant; such that different risks might induce different levels of vulnerability or trigger vulnerability in different 'vulnerable groups'. This latter interpretation is also applicable to the next point in Box 8.1 regarding the *type of response* required. The distinction between evacuation and *in situ* shelter, indicates that people's interaction or exposure to the hazard itself is an important determinant of vulnerability. Evacuation is indicative of the *scale* of the emergency (i.e. severity, geographical spread) and also the *type* of emergency. Similarly the *National flood emergency framework for England* (2010), also states that;

> Those who are vulnerable will vary *depending on the nature of the emergency*, but plans should consider: those with mobility difficulties (e.g. those with physical disabilities or pregnant women); those with mental health difficulties; and others who are dependent, such as children (Defra, 2010: p64)

The national emergency management framework for recovery, also discusses how the provision of humanitarian assistance depends on '*the type of emergency, the impact it has had on the community, and the needs of those affected*' (HM Government, 2012; p 73). Furthermore, Hampshire County Council's Multi-Agency Flood Plan (MAFP) acknowledges that depending upon the nature of flooding, other groups may be identified as vulnerable (beyond those listed). From this analysis, it seems clear that the construction of vulnerability is not divorced from the hazard at hand. This analysis suggests that emergency management, at least partially, adopts a *biophysical perspective* to vulnerability, which assumes that vulnerability is at least partially created and shaped by hazard etiologies (discussed in Section 2.2). In the context of these different documents, the hazard emerges as relevant for understanding people's susceptibilities towards *physical harm* ("physical vulnerability"). In part, this implies that *exposure* to the hazard influences the construction of vulnerability from an emergency management perspective. As discussed in Chapter 2, *exposure* concerns both the location of people within hazard-prone locations and their interaction with hazard characteristics (e.g. spatial extent, depth and velocity of flood waters).

Another facet of vulnerability, though not explicitly discussed, concerns the ***physical vulnerability of the built environment*** (i.e. property and infrastructure) towards damage when exposed to a hazard. Non-statutory guidance on evacuation and shelter, explicitly identifies

residents in caravans and single-storey buildings as vulnerable to rising water (HM Government, 2006).

These observations result from latent content analysis (Section 7.3). At the manifest level, there is no explicit discussion of the potential for unique vulnerabilities associated with different types of emergency events in any of the reviewed documents. This observation could indicate that vulnerability is conceived as generic; such that the same social groups that are vulnerable to flood hazard, are equally vulnerable to snow storms, heat waves etc. However, it is possible that this observation merely reflects the nature of emergency management documents, which are inherently designed to be flexible and *generic*, so that they may be tailored to the range of hazards or threats posed to civil protection (HM Government, 2012: p32).

To examine whether constructions of vulnerability change under different hazard-etiological contexts, additional plans for heatwave and cold weather were also reviewed (Department of Health, 2010; 2011; 2013). In this literature, the same social groups emerge in discussions of vulnerability, namely the medically vulnerable, elderly and young children. Interestingly, vulnerability in these context is also associated with *low income* households, which is a characteristic not discussed in generic or flood-specific plans. On one hand, this finding supports the previous impression that constructions of vulnerability are to some extent, influenced by the hazard at hand. On the other, it seems that the same identifying characteristics for vulnerability emerge under different hazard contexts, suggesting that vulnerability is conceived to be generic. This latter interpretation is supported by the fact that the local authorities in the selected case study areas, do not hold separate plans for different types of adverse weather and instead draw from the generic emergency response plan (e.g. IOW LA, 2009; CBMDC, 2013). This debate between hazard-generic or hazard-specific vulnerabilities is highlighted for further analysis (Section 8.3.2).

8.2.3 THE ROLE PLAYED BY SOCIAL SUPPORT NETWORKS IN DETERMINING VULNERABILITY

Returning to Box 8.1, the final point considers the *availability of social support* normally received and acknowledges the role played by social support networks. Here, it is implied that such social networks lessen vulnerability in 'normal' everyday life; however, these may be disrupted by an emergency event and thus may heighten an individual's vulnerability. From

this perspective, vulnerability is not triggered by the hazard or emergency event *per se*, but by the disruption to normality. Discussions of social support networks also provide insight into how vulnerability and resilience are conceived from the perspective of emergency professionals. Social support networks were identified as a source of resilience in the literature reviewed in Chapter 2, and emerge in this document as an influential factor upon people's vulnerability. Although there are no explicit references to the term '*resilience*', latent content analysis implies that it is still relevant to understanding professionals' constructions (and identification) of social vulnerability.

8.2.4 THE INFLUENCE OF SCALE UPON CONSTRUCTIONS OF VULNERABILITY

Scale is a latent theme that emerged in this analysis and appears to influence constructions of vulnerability. This analysis is somewhat challenged by the fact that emergency documents are inherently designed to be flexible and adaptable to different scales of event, based on the principle of subsidiarity (Section 3.2). However, there are some interesting insights that can be observed, regarding *spatial* and *temporal* scales.

Firstly, it appears that vulnerability is regarded from a professional perspective, as highly variable, both in time and space at the individual and household scale; hence the established mechanisms for data sharing. These protocols for sharing sensitive information serve to facilitate *timely* exchange of *up-to-date* information. Given the '*regular changes of names, addresses and vulnerabilities that occur'*, Hampshire County Council stresses the inappropriateness of recording lists of vulnerable people within the MAFP. *Accuracy* of information appears to be essential at this scale. To assist in this process, national guidelines for developing MAFPs specify that information administered to the public and media should include advice that encourages the at-risk public to assist "*the elderly, infirm and those with small children*" (Civil Contingencies Secretariat et al., 2008). It is noteworthy, that such communications may influence the formation of normative constructions of social-centric vulnerability evident in Chapter 6. This adopted position, assumes that the public are best placed for identifying and helping those they know to be 'vulnerable'. This is explicitly evident in Isle of Wight Council's Multi-Agency Flood response Plan, which states that "*local communities are often best placed to know the location of important infrastructure or assets and vulnerable people*" (IOW, 2011; p41).

Given the highly variable nature of vulnerability, planning documents are designed to be able to inform resource requirements *without* specific individual or household-scale information. Instead, these documents present the generic needs of identified vulnerable groups, on the basis of their needs in non-emergency situations and from professional experience (HM Government, 2008). In such generic documents, consideration is given to the potential requirements of vulnerable people and how these may change over time. For example, Annex 2 of HM Government (2008), outlines the potential requirements of vulnerable people for evacuation or sheltering *in situ*, at different points during an emergency (i.e. for 12/24/48 hours into an incident).

Although individual and household-scale vulnerabilities are not formally mapped in planning documents, point-scale representations of vulnerability are evident in the mapping of "vulnerable establishments" (e.g. hospitals, schools and nurseries; Defra, 2011b). In this context, it seems that establishments are regarded as consistent and stable (both in space and time), in their potential to be vulnerable. Such establishments are repeatedly discussed in professional documents and constitute a key component of the vulnerability assessment presented in MAFPs. Flood risk summary sheets are also presented in the MAFP and include the number of properties and an approximate number of 'vulnerable people', based on the approximate number of people within vulnerable establishments, located within the flood zone (Civil Contingencies Secretariat et al., 2008; Defra 2011b).

At the area-scale, broad patterns of vulnerability are mapped in GIS and integrated into Hampshire County Council emergency planning (following the method outlined by Hounslow Council, 2008). Vulnerability mapping is derived from 2001 census data for the output area (ca. 125 households) and calculated for *health, social and economic vulnerability* (Table 8.1). Interestingly, the census source of data is defended as it provides a standardised source of information and is deemed as more accurate in comparison to survey data. Information on vulnerability is accompanied by *hazard* mapping, based on the risks identified in the Community Risk Register, and *resilience* mapping based on the number of people subscribed to an emergency messaging system and those involved in neighbourhood watch schemes. Interestingly, this approach explicitly distinguishes between different facets of vulnerability and clearly isolates the hazard and resilience from this calculation. *Risk* is mapped by overlaying the map layers for hazard and cumulative vulnerability. Contrary to the discussion above, *exposure* is clearly separated from the construction of vulnerability in this approach and

is instead represented by the hazard boundaries. It is noteworthy, that there is no information within this document to explain how the final indices and overall vulnerability map are constructed. Moreover, it is not clear how these area-scale maps are integrated into decision making or how they are interpreted and understood. This was highlighted for further investigation in semi-structured and cognitive interviews.

This discussion shows how vulnerability is represented differently at different spatial and temporal scales. Clearly, these scales are not divorced from the different decision making scales in which emergency professionals operate. Whereas operational response occurs at the site of the incident and requires household-specific details of vulnerable individuals; in contrast, the strategic coordination of an event requires area-wide information. It seems that responders operating within this tiered command-and-control structure have different requirements of vulnerability information.

Table 8.1: Census-derived indicators used for vulnerability mapping in Hampshire County Council, emergency planning (based on method developed by Hounslow Council, 2008)

Indicator of vulnerability	Rationale
Economic vulnerability	
Method of travel to work – works mainly at or from home	In the event of an incident damaging property or requiring evacuation the person is more likely to suffer residential and business disruption.
Qualifications – no qualifications or Level 1 qualifications	Those less likely to be able to find alternative employment or access recovery services. Increased probability of longer-term psychological effects.
Approximated social grade – those on state benefit, unemployed, lowest grade workers	Those less likely to have suitable insurance, savings or the ability to support themselves following an incident.
Social vulnerability	
Provision of unpaid care – provides 50 or more hours per week unpaid care	Less likely to be able to sustain the current level of care or support others (family and friends) in the event of an incident.
Country of birth – Those born in countries classified as less economically developed by the WHO	Less likely to have English as first language or full awareness of entitlements/support services available.
Household composition – single person households	Absence of localised support mechanism. Increased probability of longer-term psychological effects.
Health	
Age – under 5 years, over 70 years	Sphere Minimum Standards of disaster response outlines those under 5 years of age as highly vulnerable due to underdeveloped immune system; and recognised those over the age of 65 years due to reduced resilience to disease.
Limiting long-term illness – includes long-term illness, health problem, or disability that limits daily activity or work.	Those more vulnerable to the effects of extremes of temperature, diseases or epidemics etc. Those less likely to be able to support themselves following an incident.
General health – not in good health	Those who may be dependent on medication or have a reduced ability to physically recover from illness or injury.

8.2.5 CONSTRUCTIONS OF VULNERABILITY THROUGH THE EMERGENCY MANAGEMENT CYCLE

In examining the professional discourses on vulnerability, it is important to consider how vulnerability is described in the context of the different phases of the emergency management cycle; from planning, response and recovery. Ultimately, these documents are designed to satisfy a number of objectives and this is arguably reflected in the corresponding descriptions of vulnerability. For instance, the primary objective of the key document, "*Identifying people who are vulnerable in a crisis*" (HM Government, 2008), is to establish who may be classed as vulnerable and the mechanisms for identifying vulnerable people in an emergency situation.

Therefore, this document is tailored pragmatically to meet these objectives and vulnerability is dominantly constructed in terms of *response.*

Whilst the similar 'vulnerable groups' emerge in discussions for preparation, response and recovery, it seems that the underlying rationale for defining these groups as vulnerable alters with the stage in the emergency cycle. In terms of *preparation*, the needs of vulnerable people are discussed in the context of tailoring risk communication methods (HM Government, 2008). In *response*, attention is focused on mobility constraints and health concerns, relevant for evacuation planning and ensuring that rest centres are adequately equipped to cater for those that have been evacuated (HM Government, 2008; HM Government, 2012). Vulnerability in this context is primarily concerned with "*physical vulnerability"*. Guidance for *recovery*, shifts attention to the humanitarian aspects of a disaster and issues of human welfare, addressing the physical and psychological effects of the emergency (HM Government, 2012). This reflects an interest in "*social vulnerability*" (defined above). Although the same four groups are considered, the chapter on recovery evaluates the needs of these groups from a different perspective. Attention is given to the psychological impacts and support mechanisms, such as the need for consistent and accurate information and reassurance; as well as more practical arrangements for meeting the needs of faith, religious and cultural groups (e.g. translators and interpreters). Moreover, in examining the multi-agency flood plans and guidance document for developing these plans, there are noticeably fewer references to '*vulnerability*' in the context of recovery as the scope for who may need assistance is widened (Civil Contingencies Secretariat et al., 2008; IOW Council, 2011; Hampshire County Council, 2012).

Interestingly, notions of '*fair and equitable'* responses to the needs of the community are only discussed explicitly in the context of recovery (HM Government, 2012; p53). This is also evident in Hampshire's MAFP, which describes the availability of hardship funds and specifies the following;

> "It is likely to be restricted to people who are most vulnerable – such as elderly people, families with young children and people with mental or physical disabilities – but not for people who simply didn't have household contents insurance" (Hampshire County Council, 2012; p104)

This description is very insightful and implies that some people are regarded as more deserving of assistance than others. In this case, this concerns those who are disadvantaged through no

fault of their own, rather than those who may have elected not to purchase contents insurance. The finding reflects the Rawlsian principle of social justice, which is based on the premise that, provided basic liberties and equality of opportunities are guaranteed, inequalities are justified if they benefit the least advantaged (Rawls, 1971; in Johnson et al., 2007). Inequity in this sense is not considered unjust, but acceptable. Whilst this principle appears to underscore professional discourses on vulnerability, it is interesting that it is only explicitly discussed in the context of recovery and is therefore highlighted for further investigation in the subsequent analysis of this chapter.

These insights highlight the recurrence of identifying characteristics of so-called 'vulnerable groups' across the emergency management cycle. However, these are applied in different ways to satisfy the distinct tasks and professional obligations that exist across the phases of preparation and planning, response and recovery. Whilst this implies that professionals operating within these phases of emergency management may correspondingly hold different interests in vulnerability assessment, this is not explicit from the literature reviewed here. The influence of professional roles and responsibilities upon constructions of vulnerability, is highlighted for further analysis from elicited interview data.

8.2.6 PRELIMINARY INSIGHTS INTO "INSIDERNESS"

The references to 'experience' are widely evident in HM Government (2012); for example, "e*xperience has shown that the quality of care and support received by survivors in the immediate aftermath of an incident is crucial in managing the longer-term psychological effects*" (p75). Moreover, the document explicitly states that "*this guidance is not intended to be prescriptive, and can be adapted in the light of local circumstances, experience and priorities*" (p3). It seems apparent that professional experience not only underscores the development of this document, but is also emphasised as an important means of tailoring this otherwise generic framework for emergency management, to the situation at hand. This is also seen in other professional documents and illustrated through the use of case study examples (e.g HM Government, 2006; HM Government, 2007).

Returning to the notion of 'insiderness', these observations are particularly interesting. On one hand, the documents are inherently 'distanced' from people's experiences of vulnerability and designed to straddle different contexts in which understanding vulnerability may be important. In these terms, the professional documents analysed in this study, are essentially etic-

orientated. On the other hand, the references to professional experience and how this has informed identification of vulnerable groups, and guidelines for addressing these potential vulnerabilities; means that the constructions of vulnerability evident within these documents may be referred to as *informed-etic* constructions. This might be phrased another way and argued that the professional documents reviewed here constitute the emic-orientated perspective on the part of the emergency professional community. Also seemingly relevant to discussions of "insiderness" are matters of scale and the phase of emergency management in which decisions are being enacted. In the analysis of semi-structured and cognitive interviews, these themes are highlighted for further attention.

8.2.7 CONCLUSIONS

This section has presented the main findings and interpretations derived from contents analysis of professional documents. These may be summarised as follows;

- The term 'vulnerability' is not explicitly qualified by adjectives that might depict a specific facet of vulnerability, as reviewed in Chapter 2 (e.g. physical, social and economic). However, implied distinctions are observed between *physical* and *social* vulnerability of certain social groups.

- Vulnerable people or groups are distinguished from the general population on the basis that they may lack self-reliance and will therefore require external assistance in the face of a hazard. Vulnerability may be identified from a number of socio-demographic characteristics; however, these characteristics do not guarantee vulnerability and professionals are 'cautioned' against stereotyping certain groups.

- Content analysis implies that hazard etiology may affect constructions of vulnerability to some extent, reflecting a biophysical perspective on vulnerability. This analysis implies that hazard exposure is at least partially integrated in constructions of (physical) vulnerability. Observations were also made concerning the physical vulnerability of the built environment. Further evidence suggested that both hazard-specific and hazard-generic characteristics exist for identifying (social) vulnerability.

- At the individual and household scale, vulnerability is conceived as highly variable, thus efforts are concentrated on protocols for data sharing across multiple agencies and encouraging the public to self-declare vulnerabilities, support or make responders aware of vulnerabilities in others. In contrast, key establishments of vulnerability are represented as relatively stable and consistent in their potential to be vulnerable. Area-wide vulnerability may be mapped through index approaches, but it is not clear how these maps inform decision making, or are interpreted and understood by professionals. These different methods for determining and representing social vulnerability, reflect the different professional needs between operational, tactical and strategic scales of decision making.

- Similar 'vulnerable groups' emerge in documents informing emergency response and recovery; however, analysis suggests that the underlying rationale for defining these groups as vulnerable varies between these phases of emergency management. This reflects the different tasks, priorities and objectives and implies that professionals acting within these phases may hold different interests and understandings of vulnerability.

- The influence of scale, phase of emergency management and the role played by professional experience are highlighted as possible axes for determining insiderness.

Content analysis has shed several insights into the construction and formal representation of vulnerability in the guidance and planning documents available to emergency professionals. Building upon these insights, this chapter now turns to analysis of interview data obtained from selected Category 1 Responders.

8.3 EMERGENCY PROFESSIONALS' CONSTRUCTIONS OF VULNERABILITY

Whilst the previous section identified a number of relevant variables for understanding how vulnerability is constructed from an emergency management perspective, it also raised a number of questions. Formal guidance and planning documents are intentionally designed to be generic and flexible to different types or scales of emergency, which makes it difficult to discern how vulnerability is interpreted between different Category One Responders,

operating within different phases of the emergency management cycle (Section 3.2). This is further complicated by the fact that the majority of the reviewed literature is targeted at multiple agencies under the premise of Integrated Emergency Management (IEM). The extent to which spatio-temporal scales of decision making and the nature of the hazard itself, inform constructions of vulnerability and the characteristics of those defined as vulnerable, also remains unclear. These gaps are addressed in this section through the analysis of semi-structured interviews (n=19) and cognitive interviews facilitated by KEEPER (n=10), administered with Category One Responders (based on the sampling strategy outline in Section 7.2).

8.3.1 THE INFLUENCE OF PROFESSIONAL ROLES AND RESPONSIBILITIES WITHIN THE EMERGENCY MANAGEMENT CYCLE UPON CONSTRUCTIONS OF VULNERABILITY

Semi-structured interviews specifically asked professionals to explain their understanding of the term 'social vulnerability', as well as discuss vulnerability more generally. Analysis showed that all professionals interviewed for this study adopt the same fundamental definition of vulnerability, as the inability of individuals to help themselves during an emergency (see quote below). This echoes the formal definition of vulnerability presented in the non-statutory guidance on '*Identifying people who are vulnerable in a crisis'* (HM Government, 2008), as analysed above. In these definitions, the lack of *self-reliance* is the main defining-characteristic to distinguish a 'vulnerable person' from the general population. Underlying these descriptions appears to be the assumption that certain social groups are more susceptible to harm (physical, psychological) and therefore, less able to adequately respond and/or recover without the need of external support. As discussed in Section 8.2.1 distinctions are evident in these interviews between the characteristics shaping **"physical vulnerability"** of the population (i.e. susceptibility to physical harm) and **"social vulnerability"**.

These two facets of vulnerability may be further distinguished and represented in terms of **"critical"** and **"non-critical"** vulnerability, respectively. Whilst these are not terms explicitly used by responders themselves, they reflect an important discourse evident in the majority of interviews; namely the distinction between the immediate risk-to-life concerns and less-pressing vulnerabilities not directly related to physical harm. Within the phase of incident response and evacuation, these latter socially-orientated vulnerabilities appear to be secondary to the former physically-orientated vulnerabilities. Thus the distinction made here between critical and non-critical vulnerability, is firmly rooted in the time-constrained context

of emergency response and is unpicked further through the next two sections. As later analysis will document, several responders interviewed acknowledge that social vulnerability may in fact become more critical in the longer term; a view which was mainly evident amongst representatives from the Environment Agency and Emergency Planning with a role to play in recovery activities. Therefore, as this section will demonstrate, professionals' constructions of vulnerability seem to reflect the different perspectives adopted by professionals operating in different phases of the emergency management cycle.

> "The people we regard as vulnerable during the emergency are those that are incapable of helping themselves and for whom we need to put in place special measures to ensure their safety and wellbeing" (Hampshire emergency management).

8.3.1.1 SUSCEPTIBILITY TO PHYSICAL HARM: "PHYSICAL VULNERABILITY"

The most common reported characteristics of vulnerability emergent from these interviews included age (i.e. elderly and young children), the disabled and individuals with a limiting long-term illness. Moreover, these are not described as mutually exclusive, as the elderly were recognised by those interviewed, as a group most likely to have some form of illness and mobility constraints. These three main characteristics all seem to depict a *physical dependency* upon others; therefore, these so-called vulnerable groups were discussed, because they would require external support to ensure personal safety (i.e. evacuation), as well as requiring special arrangements post-evacuation.

This concise construction of vulnerability is rather limited in comparison to the range of variables identified in vulnerability research (Chapter 2), but was evident across most interviews when responders answered from the perspective of emergency *response*. From these interviews it seems that the clear and concise construction of vulnerability fits the operational need for clarity, which is essential given the time-constrained nature of response decision making. Since minimising the risk to life is at the forefront of decision making at this particular point in time, there is an apparent need to know the location of individuals with physical mobility constraints or a medical dependency, to help inform decisions about evacuation. Collectively, these characteristics are classed in this research as indicative of *critical physical vulnerabilities* and are distinguished from other reported characteristics of social vulnerability on the basis of the threat posed to life. From this perspective, physical vulnerability is defined is terms of the susceptibility of certain social groups towards physical harm.

Somewhat contrasting with this finding, participants representing the police and fire and rescue (West Yorkshire) expressed caution with distinguishing certain social groups as more vulnerable than others (n= 4). Instead, these responders argued that the hazard itself (i.e. the boundaries and severity of the flood), should steer response decision making in the first instance; "*in the first phase you're scenario-led … those immediate life rescues*" (fire & rescue, Int 3). Although these professionals would act upon receipt of vulnerability information, and will prioritise response if resources allow; interestingly, this group of professionals expressed a primary interest in hazard-related information. Underlying these discussions, was an apparent assumption that anyone exposed to the hazard is vulnerable and potentially susceptible to physical harm. For example, a police officer with West Yorkshire constabulary responded; "*I think no matter what, whatever you're looking at, it doesn't matter if you're at one end of the social scale or another, you're still going to get very wet. So they're all vulnerable to flooding".* One interpretation of this finding is that vulnerability and hazard *exposure* are regarded as synonymous from the perspective of these professionals. In the first instance at least, it seems that the decisions made by *operational* responders at the site of the incident, are driven by the *exposure* of the population to flood hazard.

This latter finding may be explained by the apparent need for professionals to not think in rigid terms about *who* is potentially vulnerable. In these interviews, there was a wide recognition that vulnerability can manifest in social groups not typically defined as being vulnerable and that these individuals may "*fall through the gaps*" (Fire and Rescue, WY). The need to remain open to 'surprises' and be flexible with conceived assumptions of vulnerability is evident in several interviews and clearly described in the quotes below. It could be argued that constructions of vulnerability positioned in the context of emergency response, are deliberately kept fluid and open to change, as professionals working within this operational space are required to act *reactively* as the emergency unfolds. Furthermore, in contrast to the previous interpretation that exposure and vulnerability are regarded as synonymous; this discussion highlights the interaction between '*exposure*' with constructions for social vulnerability (see final quote below).

> "A lot of the incidents we have, whether it's flooding, could result in people who have never been classed as vulnerable on any system before to become vulnerable which means that whatever we've got, and you call it a decision support system, has got to be tempered with the fact that things will not pan out the way we expect them to and people will need help who've previously got along just fine. … We need to make sure we've the ability to react to the unusual" (IOW emergency management)

> "There are a wide range of factors that could contribute to social vulnerability and in fact, it can depend on the nature of the flood as well and that will affect people's vulnerability; whether it's deep flooding or fast flowing that will change vulnerability as well". (EA, Hampshire)

From a *strategic* perspective, two participants representing West Yorkshire Fire & Rescue described how their decisions are dictated by the potential consequences of flooding upon critical infrastructure. Using the example of the loss of an electricity sub-station, one of these responders described how this can increase the numbers of vulnerable people, beyond the geographical boundaries of the flood. During these interviews, it was clear how physical vulnerability in the context of the built environment and people can become mutually informative in constructions of vulnerability. This was evident as these particular participants described how the loss of critical services (namely electricity and water), can radiate across a place and impact upon those with a medical dependency upon electricity (e.g. oxygen supply or dialysis).

8.3.1.2 "NON-CRITICAL" VULNERABILITIES

Aside from critical vulnerability, some responders discussed the added demand placed on emergency services by social groups not defined as vulnerable *per se*, but requiring special attention (see quote below); namely relating to non-native English speakers, religious and cultural groups. This was discussed by the ambulance service, police (Hampshire), LA emergency management and the Environment Agency in the context of response (n=5); and also mentioned in discussions concerning the recovery phase of emergency management, by emergency management departments (n=3). Unlike the characteristics associated with critical vulnerability, these characteristics are not reported because they present a risk to life, but because they indicate an added demand on responding agencies and are therefore somewhat secondary to discussions of "critical vulnerabilities" (hence the reference to these characteristics as "non-critical vulnerabilities".

> "I would say it doesn't increase their vulnerability but it increases their 'neediness'…I can't think of a better word, but on the person going to assist they are more demanding because of that English is not a first language, and also possible religious beliefs, they will be a bigger demand on the service that is going to assist them. Not an increased vulnerability but an increase in demand" (ambulance service, IOW)

Outside the context of response, some responders discussed other characteristics that might be associated with vulnerability in the aftermath of the event. In contrast to response, where vulnerability is defined in terms of susceptibility to physical harm; in recovery, it seems that the concept of vulnerability is widened and defined according to susceptibility to emotional and psychological, as well as financial loss. Characteristics for identifying vulnerability are fundamentally underscored by these reasons, such as the lack of financial reserves and networks for social support. In semi-structured interviews participants were presented with a potential list of 'vulnerable' characteristics. From this list, participants from emergency management selected a range of relevant characteristics as potential indicators of vulnerability, such as access to insurance, unemployment, young families, single parent households and access to social networks. Moreover, these characteristics were selected in addition to those referred to in the context of response (i.e. elderly and health status). Whilst other professionals also offered their insights into this, the local authority emergency management departments are the main group sampled for this research, which are directly involved with coordinating and managing recovery efforts.

Beyond their duty-role, some responders also displayed an interest in "critical" and "non-critical" characteristics of social vulnerability in the context of the "day-job". This included planning (emergency management), activities for community engagement (EA, emergency management), as well as in the context of professional training (emergency management, West Yorkshire). Some examples are presented below. It is noteworthy that information on social vulnerability is valued in the context of *proactive* (rather than reactive) decision making in these examples.

> "It would allow us to target our efforts [for community engagement]. At the moment we could target efforts if we had the resource to do so, in the areas that we know are at flood risk, but within that there are areas that perhaps have more vulnerabilities which would feed into that prioritisation about where you're going to do first (emergency management, IOW; semi-structured interview)

> There's a lot of stuff here that does go into the planning process. 'Knowing the area', it would be nice to just play with it and tweak it. […] Actually it's a fantastic training tool, I could use that for my emergency planning managers on training and say 'what are we going to look at first folks? How are we going to deal with it? I don't know, where do we start? Well where's the vulnerability?' (Emergency management, West Yorkshire; cognitive interview)

A key point to observe here, is that professionals' constructions of vulnerability, and characteristics used to identify vulnerable individuals, shift between the different phases of emergency management (see first example below). This seems to reflect the different paces of decision making and shifts between reactive and proactive decision making, as outlined in Table 8.2. This is inherently tied to professionals' roles and responsibilities, and crucially the hand-over of responsibilities within the emergency management cycle. With regards to vulnerability, it was evident from interview analysis that certain professionals are less willing to engage with vulnerability assessments and are happy to rely on the expertise of others (see final quote below). This finding particularly emerged through the cognitive interviews and was observed in participants representing the police and fire and rescue. These observations have a number of implications for tailoring definitions and assessments of vulnerability to match the different professional domains; and are discussed further below.

> "I would obviously think if it was flooding and the initial thing is save your life and if you can't move, you're crippled, you're disabled, in a wheelchair initially that is number 1 is get out of the way of the flood…. Then there are longer term impacts in the recovery phase and I understand in talking to colleagues in Cumbria after the Carlisle flood that the most vulnerable people are actually the younger families and couples with young children, and that is more of a stress type issue and having to cope with living in a caravan… So often the people who don't actually think they're vulnerable are very often the most vulnerable in the long-run". (EA, West Yorkshire)

> "I think we would be very much focused on responding to water, on rescue and water management. The actual people issues I don't think would, I think we would work on the advice of other agencies … we would be reliant upon other agencies and they would be there anyway so why would we need additional information" (West Yorkshire F&R)

8.3.1.3 VULNERABILITY AS A PROBLEMATIC TERM

Emergency professionals themselves, acknowledge that they hold different interpretations of 'vulnerability' (first quote below). This was especially evident amongst those who participated in cognitive interviews, as they commented on the value of the different user-interfaces in

KEEPER (last two quotes below). Interviews also showed that this can sometimes create tensions between responders, who ultimately must collaborate and reach a consensus for approaching the situation at-hand.

> "it took a few years for an actual definition to go out on 'vulnerable', because when you would mentions who is vulnerable or what is vulnerable, everyone would look round because you would have blank faces as everyone's definition is different" (Police, Hampshire)
>
> "It makes sense, it's good that you can separate hazard, from vulnerability and then putting it all together because of the multi-agency thing, some people wouldn't be interested in vulnerability they'd just be interested in velocity and depth. But other agencies would find vulnerability the most informative to them." (EA West Yorkshire; cognitive interview)
>
> "We see it different ways but we can see the end result is helping people at the end of the day" (emergency management, West Yorkshire; cognitive interview)

Furthermore, a couple of professionals felt that the term 'vulnerability' is particularly problematic, given that it can be used in multiple contexts; from describing socio-demographic characteristics, people's attitudes and awareness towards flooding, human behaviour, to an area's infrastructure etc. This was regarded as a limitation to its use; *"It's such an umbrella terms….It's so broad so as to be meaningless"* (Fire and Rescue, West Yorkshire). Arguably, this observation reflects the lack of concerted effort within the emergency management community to explicitly assign appropriate adjectives to the term 'vulnerability'.

Clearly, a 'one-size fits all' definition of 'vulnerability' is inappropriate. Not only does the term need to be flexible to different emergency contexts and professionals, but interviews with participants from emergency management also showed that it needs to be flexible to place. Bradford District Council emergency management for instance, discussed the distribution of ethnic minority communities and cultural differences which challenge risk communication; "*To me, social vulnerability is my social community in relation to what I have out there. … people in certain communities don't pick up the phone i.e. the wife won't pick up the phone if her husband's not there; so what's the point in having a telephone warning service".* Simultaneously, IOW emergency management department discussed their unique challenges with the transient population of tourists and specific calendar events which place greater numbers of people at risk (e.g. IOW festival, Cowes week).

These discussions reveal inherent tensions in defining vulnerability. On one hand, there is a requisite for a narrow and concise definition to support operational response, to distinguish 'the vulnerable' from the general population. On the other, the term needs to be somewhat flexible to accommodate context specific details (place, hazard, time). Linked to this tension, was evidence to suggest that certain professionals are uneasy with characterising the vulnerability of certain social groups, as evidenced in the quote selected below. This also emerged during cognitive interviews and is discussed further in Section 8.4.2. Returning to the notion of "insiderness" and etic-emic-orientated perspectives, this finding suggests that some professionals are uncomfortable with their etic-standpoint and labelling others as vulnerable. This debate is unpicked further in Section 8.5.

> "…we had to define vulnerable at one point during a response before because everyone was saying 'well what is it, it means different things to different people'. The compromise that we came to was vulnerable is anyone who describes themselves as being vulnerable in response to a situation because they, the people who are affected by flooding in this case, will be able to know more than any external label that we put on them. One of the main things that we concentrated on there was making sure that anyone who saw themselves as vulnerable were able to let somebody know" (IOW emergency management)

A final tension evident in some interviews, concerns the theme of equity, which also emerged in the contents analysis presented above. Interestingly, in contrast to the findings from contents analysis, equity emerges in the context of *response*, rather than recovery (as previously found) or other activities relevant to emergency management (e.g. awareness-raising activities). Apparent from interview analysis, is that some responders are uneasy with the application of vulnerability information and argue that prioritising certain social groups during response could be at the detriment to others. This concern was mainly voiced by participants from fire & rescue and the police. For example, the comment below from Fire and Rescue is particularly informative.

> "There the people who fall through the gaps and you've got this list here, yeah we could target those but actually it's the single male in the late 40's who's on the disability allowance who spends the day drinking whisky in the middle of the day. So vulnerability is both about lifestyles, about attitude and our response I think in the main is to take a very equality and diversity sort of attitude to response (West Yorkshire Fire and Rescue).

This attitude towards social equity is potentially problematic in the sense that it points towards an assumption that people are equally vulnerable and therefore avoids the inequities in vulnerability debates (see Chapter 2). For instance, Fordham (2004; p181) asserts the need to work towards "*equitable inequalities*" to acknowledge the different needs, strengths and relative power of different social groups and challenge traditionally masculine command-and-control structures in emergency management. Here however, the discussion of equality does not appear to reflect an unwillingness to embrace difference, but instead acknowledges the highly variable and unpredictable nature of vulnerability. In this context, this attitude may be interpreted as a strategy to facilitate reactive thinking and avoiding potentially constraining conceptions of who is vulnerable; and is therefore open-minded to the differences between people. That said, this evidence does highlight a potentially important barrier to encouraging more sensitised emergence response (discussed further in Section 8.6).

8.3.1.4 CONCLUSIONS

This section has demonstrated the varied constructions of vulnerability between the professionals interviewed for this study. It is evident from this analysis that responders have different information requirements concerning vulnerability, which vary between the different scales of decision making (operational, tactical and strategic); the phase of emergency management (preparation, response, recovery and mitigation); and between the roles and responsibilities enacted by different professionals. These differences are summarised in Table 8.2.

Table 8.2: Constructions of vulnerability and information requirements of different responders throughout the emergency management cycle; summarising findings from analysis of semi-structured and cognitive interviews

Phase of emergency management	Construction of vulnerability	Characteristics for identifying vulnerability
RESPONSE - Reactive thinking - Primary interest in protecting human life	Vulnerability is defined in terms of susceptibility to physical harm, based on etiology of the hazard and where this interacts with constructions for ***physical vulnerability*** (people and infrastructure): i.e. ***exposure*** is key. Evident in police and fire & rescue	Location of the hazard e.g. spatial extent of flood, deepest and fastest flowing water. Intersection between hazard and critical infrastructure (e.g. electricity supply)
	Vulnerability is defined in terms of susceptibility to physical harm, i.e. "***physical vulnerability***"; based on characteristics of the population which signify a physical dependence upon responding agencies and risk to life ("**critical vulnerabilities**"). Evident in all responders interviewed	Mobility constraints Health concerns Including the elderly and young children
	Vulnerability is defined according to added demand placed on emergency services by certain social groups ("**non-critical, social vulnerability"**). Evident in ambulance service, police, Environment Agency and emergency management	Religion or faith Culture Language
RECOVERY - Reactive thinking - Primary interest in humanitarian and welfare support	Vulnerability is defined according to susceptibility to emotional, psychological and financial harm in the aftermath of the hazard ("**social vulnerability**"). Evident in local authority emergency management department	Lack of financial reserves (e.g. insurance, unemployment) Lack of access to social networks Mobility and health concerns
PLANNING AND MITIGATION - Proactive thinking	All of the above	All of the above

The analysis reported in this section, highlights the potential inappropriateness of the term '*vulnerability*', which is adopted throughout the professional literature without reference to a defining adjective. This study has shown that professionals assume different adjectives in their constructions of vulnerability. Whilst some articulate descriptions of *physical* vulnerability, others are concerned with *social* vulnerability. There is a clear distinction between what is termed here as "critical" (life threatening) and "non-critical" characteristics which identify a

vulnerable person (RQ2); however, this distinction must be understood within the time-constrained nature of emergency response.

Arguably, in the context of emergency management it is inappropriate to seek a 'one size fits all' definition of vulnerability. How vulnerability is constructed and identified by different professionals is reflective of a number of variables described above. Given these findings, it could be argued that more effort should be made to formally assign a corresponding adjective to the term 'vulnerability', to clearly depict the nature of vulnerability under discussion.

These observed differences amongst professionals interviewed for this research, also raise implications for vulnerability assessment in practice. Arguably such assessments could benefit from approaches that are tailored to the different interests of emergency responders and relevant to the specific phase of the emergency management cycle. These implications are developed further in Chapter 9.

8.3.2 HAZARD-GENERIC VERSUS HAZARD-SPECIFIC CONSTRUCTIONS OF VULNERABILITY

The previous section observed how hazard *exposure* can interact with professionals' constructions for social and physical vulnerability. This section returns to a debate raised from the contents analysis of professional literature, which challenged the extent to which the characteristics used to identify vulnerability, are influenced by the hazard. *Hazard-specific* versus *hazard-generic* vulnerabilities were debated in some interviews, as responders considered whether different hazards contribute towards different vulnerabilities.

Several remarked on the *generic* nature of vulnerability and consistency in their approach across all hazard types. For example, "*our flood management is just part of our overall crisis management. We do the same things for snow as we do for floods*" (Fire and Rescue, West Yorkshire). From this perspective, it seems that the same characteristics that are used to identify social vulnerability for heat waves, snow storms, swine flu etc., are equally applied to the context of flooding. Noticeably, this perspective is expressed in the context of rapid-onset, short-duration events (e.g. flooding, adverse weather).

However, other professionals recognised that the incident itself can alter vulnerability (see first quote below). For example, during the cognitive interviews and interaction with KEEPER, interviewees in emergency management for the IOW local authority remarked how the vulnerability-calculation feature could be applied at times of interacting hazards, as illustrated in the quote below. From this professional's perspective, people's vulnerability is recognised in the context of broader socio-economic processes (i.e. beyond the biophysical perspective typically discussed by participants). Furthermore, there is a recognition here of the potential interaction between slow occurring, long-lasting events (i.e. the recession) and rapid-onset flooding. In this example, financial deprivation increases in its importance for identifying vulnerability.

> "We found that for example in the snow, which in certain aspects wouldn't be that different from in a flood, how vulnerables, as you would think with pandemic flu being the old and the infirm … wasn't necessarily the case; 'oh well we had snow in the 60's and we were snowed in and we coped with everything, so therefore we have got tinned beans in the cupboard'" (emergency management, IOW; semi-structured interview)

> "…if we were in a situation of pandemic flu already and then went into a period of flooding in the new year, then perhaps we would weight vulnerability higher because we're in an abnormal situation anyway. Or for example at the moment with all the cuts and recession, all that kind of stuff, people's vulnerability could be exacerbated from their general deprivation, so the deprived people could be more deprived, the people who are middle class, second home owners that we have a prevalence of on the Island suddenly dip-down to become more vulnerable, just from their social level, so therefore the weighting of vulnerable could be more than equal, because of the current climate that we're in. So I like that flexibility." (Emergency management, IOW; cognitive interview)

With regards to different types of flood hazard specifically, in nearly all cases, responders did not consider the type of flooding to be important in determining vulnerability. Whilst professionals acknowledged differences in the impact (i.e. geographical spread and severity), as seen in the example below, this does not change the construction of vulnerability. The approach for identifying vulnerability is simply scaled-up to correspond with the size of the event.

> "…we know that the impacts from different types of flooding are very different. For us what we call surface water flooding has the main impact on the highways. But if we had Environment Agency, Met office or coastguard warning us about tidal, coastal flooding then we know that's more about properties. So how we might react to what we might expect to happen and have to do, would be different to different flooding." (Emergency management, Hampshire)

Collectively, these findings have implications for vulnerability assessment and mapping. Predominantly, vulnerability appears to be regarded as a largely generic condition, affecting the elderly, the young and those with existing disabilities. Whilst the type of hazard may inform different actions, the groups considered to be vulnerable largely remain unchanged. Although previous discussions have shown that responders recognise the highly variable nature of vulnerability, it appears here that the defining characteristics of who is 'vulnerable', remain relatively static in the hazard context. However, a select number of participants, namely with LA emergency management, felt that different types of hazards could alter assessments of vulnerability. In the previous section it was argued that vulnerability assessments might benefit from the use of more tailored indicators for social and physical vulnerability, to satisfy the different needs professional end-users operating in different phases of emergency management. Arguably, this latter finding highlights the potential value of vulnerability assessments that are malleable to different hazard contexts, where vulnerability may vary between different flow-out characteristics of certain hazards (rapid or slow onset events), or at times of overlapping hazard events (Alexander et al., 2013).

8.3.3 PROFESSIONAL EXPERIENCE

To this point, this section has analysed how constructions of vulnerability vary between emergency professionals working in different phases of emergency management, and explored the influence of the hazard upon these constructions and identification of vulnerable groups. A final point to consider, is the potential role played by professional experience. Indeed, the contents analysis presented in Section 8.2.6, showed how professional literature draws from 'experience', drawing from 'lessons learned' and case study examples. Interview analysis also highlighted the importance of acknowledging the influence of experience upon constructions of vulnerability.

The professionals selected for this study vary in the length of their professional careers; whilst some were relatively new to their professions, others were nearing retirement. In the latter context, experience is clearly accrued over the years, from different job specifications and responsibilities. Therefore, the views expressed during the interview not only reflect the professional's perspective from their current role at that specific point in time, but are also to

some extent shaped by perspectives held in the past under previous roles. In the context of this thesis and its study of "insiderness", it is important to acknowledge this.

Also important, is the observation of how professionals draw from their experiences to articulate their views on vulnerability. For example, the emergency management department within the IOW Council adopted the view that the public are best placed to identify and self-declare vulnerability. However, these participants described how this can be problematic when some people call their department for meaningless reasons, whilst others are reluctant to "*make a fuss*" despite needing help. A participant from Hampshire county council emergency management presents an alternative view on vulnerability, not related to the public at-risk but concerning responders themselves (see first quote below). The importance of professional experience is also discussed by a participant from emergency management (West Yorkshire) during the cognitive interview, as he explains the value of KEEPER in training and exercising of people less experienced in the job. Also evident in these interviews, is that professionals draw from their personal-professional experiences, as well as awareness of other's experiences in different places. Adding to this, a couple of professionals interviewed referenced findings from academic research (see second quote below).

> The last time we had a flooding emergency in Hampshire, we had 2 police officers stuck in their car in 9ft of water under a railway bridge, now for the period they were in there, I would describe them as being vulnerable. (Emergency management, Hampshire; semi-structured interview)

> "I think it was Oxford there was a study done where people with drink problems 12 months after the flood, the 1998 flood, which developed because of the stress of the flood. So there is longer term vulnerability." (EA, West Yorkshire; semi-structured interview)

One participant also reflected on the tensions sometimes experienced between strategic and tactical/operational responders working at the site of the emergency (see quote below). This example illustrates how perspectives of vulnerability may conflict between those physically distanced from the scene in the strategic command room, and those interacting with the affected community.

> "…to say 'we are going to leave those people now and move everything now down to a building that's got nobody in and we're going to put everybody down there'. And that's really difficult, at the time there's a lot of pressure from the media and your own crew, pulling your crews away from something that has an immediate, humanitarian aspects to it and telling them to go down to a water treatment works remote from anywhere and with nobody in. You get resistance from all sorts."

Evident from this analysis is the influence of professional experience upon perspectives of vulnerability. Moreover, this final example in particular, highlights how different degrees of interaction between responders and the affected community, can shape different constructions and strategies for addressing vulnerability (discussed also in Section 8.3.1). Both these points, appear to be relevant to the discussion of 'insiderness', which is unpicked in-depth in Section 8.5.

8.4 INDICATING FLOOD VULNERABILITY

Despite the dominance of indicators and indices in vulnerability research (Section 2.5), only a small handful of interviewees were aware of the application of vulnerability indicators in practice. Moreover, although vulnerability indices are mapped by Hampshire County Council, it was not clear from contents analysis alone, how these inform decision making (discussed in Section 8.2). KEEPER presented participants with a variety of methods for mapping vulnerability and interacting with indicators. Whilst this approach primarily sought to facilitate insights into the discussion of the previous section (and RQ2), this section departs slightly from the research questions and examines how the professionals participating in cognitive interviews, responded to this etic-orientated form of calculating and representing vulnerability. This analysis reveals a number of barriers and opportunities for vulnerability mapping in practice and is therefore relevant to understanding some of the implications of this research

8.4.1 SELECTING AND WEIGHTING VULNERABILITY INDICATORS

One of the concerns with a packaged index of vulnerability is that its assumptions may not be apparent to end users, such as the selection and weighting of indicators. Some professionals described the use of vulnerability indices in practice, but equally could not explain the make-up or aggregation of these indicators (n=3). Arguably this creates a 'blind user' and is illustrated in the quote below. Whilst this observation is based on a very limited sample, it does hold implications for area-wide vulnerability mapping and the inclusion of these maps in decision making. Indeed, if such vulnerability products (i.e. indices and mapping), are not understood, then the resulting decision is not fully-informed. On one hand, this finding might suggest that some responders are overly-reliant on so-called 'experts' and therefore unwilling

to fully-engage with vulnerability. On the other, it might be the case that such area-wide maps hold little value in practice, or are surpassed by other sources of information, in which case, the particulars are not regarded as important.

> Because when I send you that document you'll see that they've done the vulnerability mapping and have overlaid the hazard mapping over the top. I don't know how they've calculated the hazard zones, but at least we know the exact dimension of the hazard area because it's been provided for us by the agency … But I don't see how they can come up with figures for the other stuff [vulnerability map]. Unless they just make it up. I'm not saying we necessarily claim to understand what somebody else has done because we've just got hold of somebody else's work and why they did it is a bit of a mystery at the moment. (Emergency management, Hampshire)

Observing participants' interaction with KEEPER and corresponding responses, showed that some responders are willing to engage with vulnerability mapping. For instance, the option to adjust the spatial scale at which relative vulnerability is calculated, seemed to add to the regarded 'usefulness' of the Social Flood Vulnerability Index (SFVI), particularly given the variable scales of flooding and decision making. Furthermore, the option to isolate indicators was valued as a means of understanding the SFVI, tailoring FIM activities such as awareness-raising campaigns (EA, WY) and visualising the social 'make-up' rather than relying on pre-conceived assumptions of the area (Emergency management, IOW).

> "…people are always very interested but will either start to disbelieve or start to make-up facts and with things like this it's good to have a visual button where you can click on to say no, no, no click on and read that this is what this about. Because the thing is, anywhere where you live you think you know really well and a lot of people perhaps that we might be briefing will say oh we know that Ryde's the most deprived and that most of the old people live in West Wight, and we know that the south is the most inaccessible and not many people live in the south. That might not actually be true and you've just clicked on lots of things and shown that it might be different from reality" (Emergency management, IOW)

Vulnerability indices have traditionally applied equal-weighted models which has been a recurring problem highlighted in the literature, resulting from the lack of defensible, objective weighting schemes (Wilson, 2008; Cutter et al., 2003; see Chapter 2). The interview findings presented in this chapter have so far demonstrated the different constructions of vulnerability between different professional groups and activities within FIM, which implies the need for more flexible forms of assessment. However, there was mixed feedback on the user-constructed index. More positive responses were evident amongst emergency management and the Environment Agency and voiced in terms of tailoring assessments to decision making

(EA Hampshire) and place-based comparisons (Emergency management, IOW). Furthermore, it was recognised that this area-wide form of assessment could support strategic decision making and priority-setting in the context of widespread flooding (Fire and Rescue, WY).

> "I think that's really good and just to see as you went down, e.g. well unemployment that's not really so important to responding to a flood event, but some of them like elderly really are. So to be able to select them out a bit I think is really important and I'd almost want to go straight to this page if I was looking at this information and I wouldn't look at the other pages." (EA, Hampshire)

> "..I think that's where these drop downs could really come into their own, because you would choose these which are relevant to Cowes, you know unemployment is not that important; however in Ryde you might have other variables rated high or less in your drop-downs and therefore comparing Cowes to Ryde in the colours would then show me more… actually seeing it in the round, comparing place to place " (Emergency management, IOW)

There was a degree of negativity surrounding the indicator/index approach and least interest expressed by blue-light responders. Ultimately it seems that professionals' feedback reflected a mismatch in scale between a property-scale flood hazard assessment and community-wide vulnerability assessment (see quote below from West Yorkshire police). While this is discussed in more detail in the next section, it was evident that tactical and operational responders require the identification of specific vulnerable households (e.g. dialysis patients). Moreover, given the decadal nature of the census, many responders commented on the danger of relying on out-dated information for informing response. A final concern voiced by emergency management and the police for Hampshire was that individual responders may deduce vulnerability differently. While KEEPER satisfies a need for flexibility, multi-agency working would still be required in vulnerability calculations to satisfy the integrated emergency management framework.

> It's not useful enough. I remember when I spoke to you last time what I really wanted was [*town name*] to come up and above each house for it to say get here first this one's on dialysis, get to this one next because they're over 75 and don't have a car, but you can't possibly come up with a system that does that. We have to rely on other methods for identifying those. (Police, West Yorkshire)

It was apparent from these interviews that FIM professionals have different conceptions of how vulnerability can be assessed, mapped and applied in decision making. In part, this reflects the different roles, responsibilities and scales of decision making. However, it also

reflects limitations in the reliance of census data and issues of temporal and spatial accuracy of information, which is considered in depth next. What is clear from this discussion is that more interactive and malleable forms of vulnerability assessment would be welcomed by certain professional groups. Moreover, more flexible forms of area-based assessments could support the tailoring of assessments to hazard and place contexts and the move away from "one size fits all" approaches. This is the main opportunity for better integrating vulnerability indicators and mapping in practice; however, there are also a number of barriers to this, which are now evaluated.

8.4.2 BARRIERS AND OPPORTUNITIES FOR VULNERABILITY INDICATORS AND MAPPING

Cognitive interviews facilitated by KEEPER, revealed a number of barriers and opportunities for the application of vulnerability indicators and mapping in practice. This section summarises the main points in turn.

Limitations in spatial and temporal scale

Scale was a recurring theme in professional discussions. Essentially, the utility of vulnerability information depends upon the spatio-temporal scale at which it is recorded and compatibility with decision making scales (operational, tactical and strategic). Indicators and indices reflect area-wide forms of assessment and are therefore both limited in time (i.e. often reliant on decadal census data) and space (mapped to administrative boundaries). This is at odds with the point-scale accuracy and dynamic modelling of the flood hazard. This tension was evident in professional discussions of the risk interface of KEEPER where hazard and vulnerability information were positioned side by side.

The Social Flood Vulnerability Index (SFVI, after Tapsell et al., 2002) was included in KEEPER and represents a classical approach in vulnerability assessment. This method was adapted to enable vulnerability to be standardised according to different spatial scales, with relative metrics of vulnerability assigned to the output area (ca. 150 households) and for the individual properties within the output area. However, the fact still remains that the underlying data structure originates from a broader spatial scale, which results in abrupt and meaningless shifts in vulnerability (as illustrated in Figure 8.1). This form of vulnerability assessment is subject to the principles of *ecological fallacy* (Lloyd, 2010). Essentially, the aggregation and mapping of data within such census-defined boundaries creates an impression of area

homogeneity and masks the intrinsic variability that exists within. Furthermore, area-wide assessments of vulnerability are also subject to what has been termed by Openshaw and Taylor (1979) as the Modifiable Areal Unit Problem (MAUP); meaning that the scale at which vulnerability is calculated will directly influence the resulting score and interpretations of vulnerability.

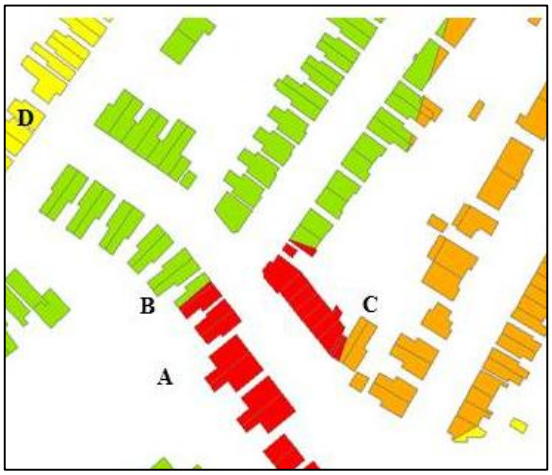


Figure 8.1: Abrupt shifts in vulnerability. Household A is a category 5 (very high vulnerability); Household B is a category 2 (low vulnerability); Household C is a category 4 (high vulnerability); and Household D is a category 3 (average vulnerability): (From Alexander et al., 2011)

Professionals interviewed in this study heavily discussed these limitations in adopting census-derived indicators to support decision making. Indeed this received proportionally more discussion-time than the uncertainties surrounding flood modelling. The acute awareness of these limitations (e.g. the decadal timescale of the census and issues of accuracy) means that this form of vulnerability assessment is considered useful only as a 'broad brush' approach to painting an area's social make-up. In terms of FIM, these assumptions are acceptable in the context of high-level, strategic decision making, but become problematic when seeking to adopt such methods to inform local-based decisions. Operational and tactical FIM requires point-specific vulnerabilities and knowledge concerning local variability (i.e. 'hotspots' of vulnerability and critical households), and are dependent on networks for data sharing across professional partners. Whilst this approach is regarded as the best means available for accessing vulnerable individuals, frustrations are still created by the issue of aging data, demonstrated in the quote below.

> One of the frustrations is, is this out of date? It's a patch-work approach. No one agency holds all that information. … and we have had frustrations with out of date information, because once somebody's on our client databases … and for other record keeping reasons, people don't come off the register. So it might be that people aren't vulnerable and also we've had instances where we've had addresses listed and people have moved or have died. (Emergency management, Hampshire)

The majority of professionals interviewed acknowledged the impossibility of mapping household-scale vulnerabilities given the high temporal variability of vulnerability, as well as issues of data protection. Collectively, these limit the extent to which vulnerability mapping at this scale is deemed *possible* and *advisable*. In terms of mapping, these findings suggest that vulnerability may be justifiably side-lined where lists of vulnerable households exist and detailed flood modelling can highlight those potentially at-risk. However, as the previous section certified the area-wide approach to vulnerability assessment is still valid for certain activities in FIM and could be enhanced by interactive and malleable decision support tools (such as KEEPER).

Caution with constraining vulnerability assessment

Another barrier emergent from some interviews, is the seemingly prescriptive nature of vulnerability indicators. During semi-structured and cognitive interviews, professionals were presented with a number of indicators typically used in research and in indices applied in practice (SFVI, IMD) for the identification of vulnerability. This prompted debates about how *representative* these are of vulnerability. Indeed, many participants emphasised the grey nature of such characteristics and observed how an indicator can indicate either high or low vulnerability, as exampled below.

> "Yeah I was looking at the home ownership one and it's kind of a mix because a lot of the council tenants get a lot of support from the local council when their properties flood because it's the council's duty to maintained council-owned properties. And then you've got the other side of people who own their own homes and are slightly richer and can afford insurance. But then you've got in the middle of that people who own their own homes but can't necessarily afford insurance and they go uninsured and they shouldn't really in a flood risk band or wherever they live and their kind of in that middle ground, they're not rich enough to help themselves but they're not in a council owned property so the council can do very little to support them." (Environment Agency, West Yorkshire)

Caution was expressed by a couple of participants, who queried the impact of prescribed indicators upon professional thinking. Even though it is standard practice to think about vulnerable individuals and a recurring list of characteristics are evident throughout non-statutory guidance documents and emergency plans, there is clearly a concern here. As the quote selected below indicates, professionals are required to think '*outside the box*' and be prepared for the surprise element of emergency incidents. In this instance, the method for selecting indicators in KEEPER prompted concerns about the potential risk of relying on

technological decision support tools, which could threaten professional training to think flexibly. Similarly, this was observed in discussions concerning the visualisation of flood hazard and the impression of certainty portrayed.

> "… I was concerned that if it would be something that is a bit more scripted, tick a box if (663) we did that, tick a box of we did this, it would then funnel the mind into being a bit more closed and blinkered, rather than opening up to the fullest extent of what one's day job role is, to think outside of the box, because if they're thinking that they've got a handy tool that does all this for them and seems to be looking right and giving them the right answers, it's just too good to be true and they don't need to think so therefore they won't. (IOW emergency management)

> "When you show an animation you get caught up in it and you forget this is plus or minus depth…I think it's good because animation engages people better…But it's that uncertainty that gets forgotten" (EA, Hampshire).

Barriers and opportunities for technology in decision support

Although KEEPER was greeted with interest and received a lot of positive feedback (Alexander et al., 2013), there are clear boundaries to the application of technology and what it could/should and could not/should not support decision making. In the first instance, several responders made it clear that they would never rely on technology, particularly given their interaction with emergency situations and loss of electrical power. Secondly, participants involved in cognitive interviews discussed the supporting capabilities of KEEPER and other decision support tools and how these could be used to complement existing practices for data sharing and prompting proactive (rather than reactive) response. In addition, several responders discussed the value of such instruments in professional learning, training and exercising. However, practical barriers to technological decision support were considered; from the compatibility of different computer systems and data outputs, user-friendliness and simplicity, to the resources available to implement such systems. Furthermore, the seeming certainty and accuracy communicated in visualisation emerged as another cause for concern and as the quote above suggests, there is a fear that this could result in the channelling of professional thought processes, thus undermining the effectiveness of emergency management.

This debate is tied to observations in science and technology research. All forms of decision support tools and GIS can be thought of as social constructs, for they are shaped by the inventors and practitioners within a specific context (Sheppard, 2001). As is described in the science and technology literature, this relationship is symbiotic and evolutionary; user needs

and requirements change through time and through interactions with technology, and this in turn informs the design and survival of certain technologies over others (e.g. Pinch and Bijker, 1984). We live in an increasingly visual and spatially-referenced world, which has corresponded with changing scientific and societal demands (MacEachren, 2001). In the context of mapping and visualisation, this has coincided with a shift in status and blurred distinction between map-maker and map-user (Alexander et al., 2013). The impact of this transition in FIM is something which is under-researched and further attention is warranted into the implications for decision making practices, shifts in data requirements and potential changes in public tolerance for 'poor' decision making. Indeed there are a host of research questions to be addressed in this field. In terms of this research, there is a need to consider the impact of "boxing" vulnerability and indicator-thinking upon professional constructions and the potential for undermining the nuanced understanding discussed in Section 8.3.

The interactive nature of KEEPER sought to prompt *visual thinking* (MacEachren, 2001) and allow professionals to integrate their subjectivities into the calculation of area-wide vulnerability to avoid the 'blind user' evident in some interviews. From this perspective, KEEPER was highly rated by professional interviewees. Furthermore, some professionals considered how visualisation could be used to challenge professional assumptions about place; *"Because the thing is, anywhere where you live you think you know really well and a lot of people perhaps that we might be briefing will say oh we know that Ryde's the most deprived … That might not actually be true and you've just clicked on lots of things and shown that it might be different from reality" (Emergency management, IOW)*. These findings demonstrate opportunities for such instruments in practice. Indeed, this study suggests that this interactive forms of vulnerability mapping may encourage reflexive and critical thinking amongst interested responders (namely local authority emergency management departments). Moreover, on the basis of these interviews, it is argued that more malleable and interactive forms of vulnerability assessment could facilitate exploration into the contextual factors shaping vulnerability.

8.5 EXAMINING HOW PROFESSIONAL CONSTRUCTIONS OF VULNERABILITY VARY ACROSS GRADIENTS OF "INSIDERNESS"

As previously examined in the context of residents (Chapter 6), "insiderness" is a term adopted in this thesis to represent a conceptual proximity between the research participants and the

experience of flooding and flood vulnerability. Therefore "insiders" are assumed to be those able to offer insights into the lived experience of the studied phenomenon (Section 2.4.2). From the perspective of residents, insiderness was represented within a three-dimensional space, based on the axes of *exposure, experience* and *awareness* of flooding, which were assessed via objective and subjective lenses. The analysis presented in Chapter 6 also evaluated the extent to which "insiderness" is an explanatory variable of declared vulnerabilities and the different reported constructions of vulnerability. These axes are clearly inappropriate in the context of emergency professionals.

The nature of professional roles and statutory responsibilities, inevitably creates a degree of distance between professionals and those who have experienced flooding and vulnerability. Therefore, professionals cannot be described as "insiders". However, as this chapter has so far demonstrated, emergency professionals operate within different professional domains, shaped by roles and responsibilities that vary between the phases of emergency management and scales of decision making. Consequently, professionals vary in their interaction with the public (and those experiencing vulnerability). Therefore, it would be wrong to describe all emergency professionals as a homogeneous group of 'outsiders'. At the same time, it is equally wrong to suggest that "outsiderness" is negative. As this chapter has demonstrated, "professional outsiderness" is essential for strategic-based decision making. This section develops a means of determining the boundaries of insiderness amongst emergency professionals and considers how the different constructions of vulnerability presented in this chapter might be aligned across this gradient. Implications for practice and future research are also evaluated.

8.5.1 DETERMINING THE BOUNDARIES OF INSIDERNESS

In determining the boundaries for 'insiderness', axes need to clearly capture the conceptual distance between those acting on vulnerability (i.e. responders) and those experiencing vulnerability (the public). From this analysis, it is clear that the **phase of emergency management** is an important distinction. Planning, response, recovery and long-term activities for mitigation (e.g. community engagement), are associated with different professional activities, which may or may not bring professionals into contact with the public; depending upon the spatial scale at which these activities are enacted.

The **spatial scale of decision making** is another aspect governing 'insiderness'. Evident from these interviews, is how the operational, tactical and strategic scales of decision making seem to govern the physical (and potentially emotional) distances between professionals and the public at-risk. While some are required to adopt an objective standpoint and consciously detach themselves from the residents experiencing flooding (i.e. for strategic decision making); those operating at the operational scale must directly engage with the affected population. Discussions of operational, tactical and strategic tiers of command and control are particularly relevant to the *response* and *recovery* phase of an emergency event. Adjacent activities in *planning* or longer-term *mitigation* are also conducted at different spatial scales.

The interaction between the *phase of emergency management* and *spatial scale of decision making* upon professional "insiderness" is illustrated in Figure 8.2. In contrast to the three-dimensional cube of insiderness represented in Chapter 6, professional insiderness is depicted in this two-dimensional space only. Figure 8.3 illustrates how professionals may transition across this space, and between categories of 'insiderness', depending on the phase and scale of decision making. In this context, professionals can be thought as adopting multiple personae.

As previously mentioned, professionals cannot be described as '*insiders'*, as this category must be reserved for those who can offer first-hand insights into the experience of flooding and flood vulnerability[55]. Distinctions are therefore made between *informed-insiders, informed-outsiders* and *outsiders*. In the outset it is crucial to acknowledge the possible tension with the term "outsider", which might imply that some professionals are uninformed in their decision making. This is clearly not the case and such tensions with language are unpicked in Chapter 9. Instead, 'outsider' signifies a professional detachment from the public experiencing flooding (i.e. at the site of the incident); for example, those operating in the Strategic Coordination Group (SCG) may be described in this capacity.

In contrast to the method developed to assess the 'insiderness' of residents interviewed for this research, the method presented here is assessed *objectively* by the researcher and not informed by subjectivities of the professional participants. Interviews with residents revealed disparities between objective and subjective interpretations of exposure, experience and awareness, which justified the use of these two perspectives for assessing insiderness in

[55] Although professionals may have *personally* experienced flooding, the analysis of insiderness presented here is orientated from a professional perspective, only.

Chapter 6. However, this is not relevant here. Another important distinction is that, unlike resident participants who were individually aligned to axes for insiderness, this is not possible with professional participants. Firstly, this is due to the fact that the professionals interviewed adopted multiple perspectives to answer interview questions; speaking from the perspective of the 'day-job' or 'duty-role', orientated to different phases of the emergency management cycle. Secondly, interviewees also act as representatives for the organisation or agency to which they belong. Consequently, "insiderness" is critically discussed using insights from the contents and interview analyses of this study and considers the perspective of those interviewed, as well as the wider organisation/agency represented by the participant or the reviewed documents.

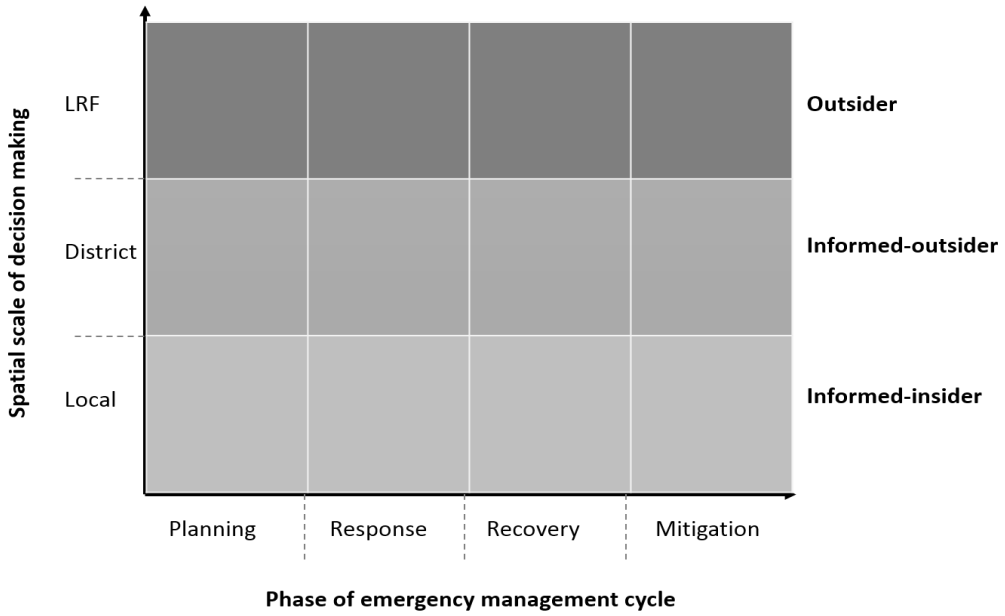


Figure 8.2: A conceptual space for determining the boundaries of "insiderness" amongst emergency professionals interviewed for this research. Where *LRF scale* indicates the spatial boundaries of the Local Resilience Forum (based on Police areas)

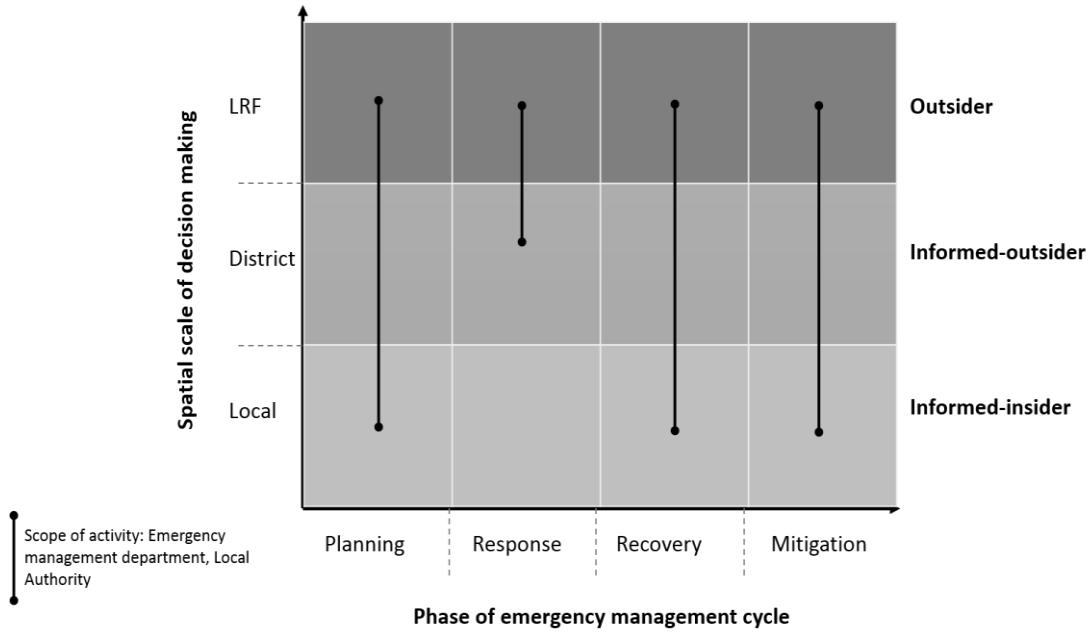


Figure 8.3: Illustrative example of how professional groups may transition across boundaries of "insiderness": Example of emergency management department with local authority

8.5.2 CONSTRUCTIONS OF VULNERABILITY ACCORDING TO PROFESSIONAL "INSIDERNESS" & "OUTSIDERNESS"

The previous section outlined how Category One Responders may be described as informed-insiders, informed-outsiders or outsiders, depending upon the phase of emergency management and the spatial scale of decision making at which the responder is acting. This section examines how the findings presented in Sections 8.2 to 8.5, manifest through the different categories of insiderness, considering different phases of the emergency management cycle. Simultaneously, the extent to which gradients of insiderness can be discerned is critically evaluated.

EMERGENCY PLANNING

All Category One Responders have a statutory duty to plan for all possible threats that are identified through the Community Risk Register (CRR) (Chapter 3). Planning in this context is therefore, not concerned with occurring events, but with events that have the potential to occur in the future. Professionals involved in the construction of planning documents, and to some extent the documents themselves, may be aligned to the gradient of insiderness depicted in Figure 8.2, according to the spatial scale at which they are focused.

At the local scale, the development of community flood plans involves partnership-working between the Environment Agency, the local authority emergency management department and communities themselves (possibly including elected local representatives and voluntary organisations). This constitutes an example of *informed-insider* working, as it brings these professionals into contact with those who can potentially offer an insider's perspective (i.e. first-hand insight into the experience of flooding). This may in turn, influence how vulnerability is defined and determined on the basis of "insider" interaction and inclusion of "insider" knowledge.

Most planning documents for flooding represent a step-up from this and are focused at broader spatial scales for the district or island-wide, or LRF. Moreover these plans are within the custodianship of the multiple agencies (rather than the community itself). Such planning activity arguably constitutes *informed-outsider* working. Above this, are the generic emergency planning documents and national guidelines, which are constructed irrespective of the hazard and local-scale details. Planning is inherently hierarchical in the UK, such that these generic documents establish guidelines for activity that filter top-down into more *informed* planning documents. From this perspective, it might be argued that the constructions of vulnerability evident in these documents can be described as "etic", i.e. based on an external ("outsider") perspective. However, as highlighted in the contents analysis in Section 8.2, such documents are also informed from bottom-up insights and draw from case study examples and experiences; thus to some extent, these might be described as derived or informed-etic constructions.

These observations make the assessment of insiderness particularly problematic and potentially inappropriate in the context of emergency planning. Planning documents are designed to be inherently flexible to the different requirements of responders and the event as it unfolds. Arguably, it is in the context of an actual event (response and recovery), where these plans are interpreted and put into action, that the influence of insiderness upon constructions of vulnerability can be more meaningfully assessed.

EMERGENCY RESPONSE

In the context of emergency response the insiderness gradient is applicable to the operational, tactical and strategic tiers of decision making. Responders acting at these scales may be described as informed-insiders, informed-outsiders and outsiders, respectively.

Fundamentally, across each tier of decision making, responders are concerned with the *exposure* of those with *critical "physical" vulnerabilities* to the hazard (i.e. where there is a risk to life). However, as documented through the analysis of professional interviews discussed above, nuances can be observed across professionals operating at different scales.

Participants representing police and fire & rescue, and offering an *operational perspective*, were primarily concerned with the *exposure* of the population and the spatial extent, depth and velocity of the flood hazard (i.e. flood etiology). These responders adopt the position that vulnerability can be created by the hazard, thus *anyone* can become vulnerable. This construction of vulnerability is concerned with the susceptibility of people towards physical harm (i.e. *physical vulnerability*), but is more explicitly shaped by *exposure* than is evident in other responders; i.e. vulnerability is *hazard-dependent*. From interview analysis it is evident that this perspective is intentionally flexible and non-discriminatory about who constitutes a vulnerable person. Discussions of social equity in this context, are shaped by the recognition that vulnerability is highly variable at the household scale. Consequently, it seems that the dynamics of the hazard are deemed more amenable to informing response.

From a tactical perspective, priority is given towards the identification of critical physical vulnerabilities within the population exposed to flooding. This perspective recognises that there are pre-existing, hazard-independent vulnerabilities that heighten susceptibility towards physical harm (e.g. those with mobility constraints and medical vulnerabilities). It is at this scale that networks for data-sharing and multi-agency working are crucial for targeting and prioritising operational response (i.e. being *proactive*). Equally important at operational and tactical scales of decision making, are self-declared vulnerabilities expressed by the public. Interviewees from emergency management departments and "blue light" responders emphasised the importance of *reacting* to those who declared themselves to be vulnerable; the obvious example of this is response to 999 calls. As previously mentioned, a select number of responders displayed a degree of uneasiness with their inherently "etic" standpoints; "*vulnerable is anyone who describes themselves as being vulnerable in response to a situation because they, the people who are affected by flooding in this case, will be able to know more than any external label that we put on them*" (emergency management, IOW). Secondary to physical vulnerability, is social vulnerability and "non-critical" characteristics of the population, such as language, religion and culture. Crucially, these do not denote vulnerability per se, but an added strain upon responding agencies.

At the strategic scale decisions are made 'off-site', i.e. away from the flood incident itself. From this perspective, constructions are mutually-informed by the interaction between *physical* vulnerability of people and of the built environment. At this scale, attention shifts to how the physical vulnerability of people may radiate beyond the boundaries of the hazard itself with the loss of critical infrastructure (e.g. electricity, water, telecommunications). Therefore, constructions of vulnerability are not necessarily grounded at the site of the flood incident *per se*. Professional detachment from the scene of the incident and those directly impacted, is essential for effective emergency management. This is described here as "**professional outsiderness"**.

RECOVERY

Although a broader range of stakeholders are involved in the recovery process, only emergency management departments with the local authority were targeted in this research, which focused on those responders with a statutory responsibility only. From this perspective, vulnerability is constructed within a broader social context and moves away from the notion of critical, physical vulnerability. Instead, these responders are interested in the characteristics which might heighten susceptibility towards emotional or psychological harm and those that limit a person's capacity to recover. Whilst this may include the same characteristics listed in the context of critical vulnerabilities, the underlying rationale has shifted. Other responders offered similar insights into the recovery phase, though this was not directly within the remits of their professional roles or agencies.

It is difficult to examine gradients of insiderness in the context of recovery, given that other relevant stakeholders were not sampled for this study; thus this is identified as an area for future research. The key point here, is that there is a noticeable difference between response and recovery-orientated constructions of vulnerability.

MITIGATION

Mitigation activities include those conducted adjacent to a specific occurring event, though relevant to enhancing the efficiency and effectiveness of emergency response; such as professional training and exercising, or working with communities to enhance risk awareness. During cognitive interviews in particular, emergency management departments, the Environment Agency and fire & rescue, discussed the value of vulnerability information in this

context. Here, it seems that the full range of vulnerability constructions discussed above are of interest.

RETURNING TO RESEARCH QUESTION 3

The third research question asked the extent to which is it possible to infer insider-outsider boundaries and the influence of "insiderness" upon constructions of vulnerability. This is inherently problematic from the perspective of emergency professionals. Firstly, as emphasised throughout this analysis, professionals adopt multiple perspectives and operate at different levels of insider/outsiderness depending on the task at hand. Secondly, professional experience is highly influential. Professionals inherently accrue experiences as careers progress through the hierarchy of roles. Therefore, those acting at the strategic ("outsider") scale are likely to have accumulated a wealth of first-hand experiences and be potentially more knowledgeable than those currently working within the "insider" domain. Moreover, the analysis presented here showed how those working at the operational scale ("informed insiders") are in fact less willing to embrace nuances in vulnerability, instead preferring hazard-centric constructions and safety-orientated views of who is vulnerable.

In this research, the perspective of 'the emergency professional' was sought in an attempt to extend the gradient of "insiderness" and explore how constructions of vulnerability potentially transition from the inside-out (see Figure 2.2). However, whereas "insiderness" is desired in the context of residents and relevant to targeting and tailoring communications in FRM; insiderness in an emergency management context, is arguably less desirable. In fact, from these interviews it is clear that "outsiderness" is equally, if not more, important.

This raises an important question concerning the value of examining "insiderness" in this professional context. On one hand, the examination of "insiderness" has shed useful insights into the different constructions of vulnerability held by emergency professionals. Moreover, this analysis has highlighted the different needs and interests in vulnerability information, from which a number of recommendations can be made for advancing assessments of vulnerability in practice (developed further in Chapter 9). However, as a heuristic device through which future research might be steered, "insiderness" is seemingly less relevant. Given that "insiders" are defined as those able to offer accounts of lived experiences, one might argue that "insiderness" is a property of the at-risk population, only. Instead of extending this gradient of insiderness, with "insider" members of the public at the centre, it may be more

meaningful to adopt a different perspective; using the heuristic notion of "outsiderness" or even "professional insiderness" to examine this research group in the future.

8.6 CONCLUSIONS & IMPLICATIONS

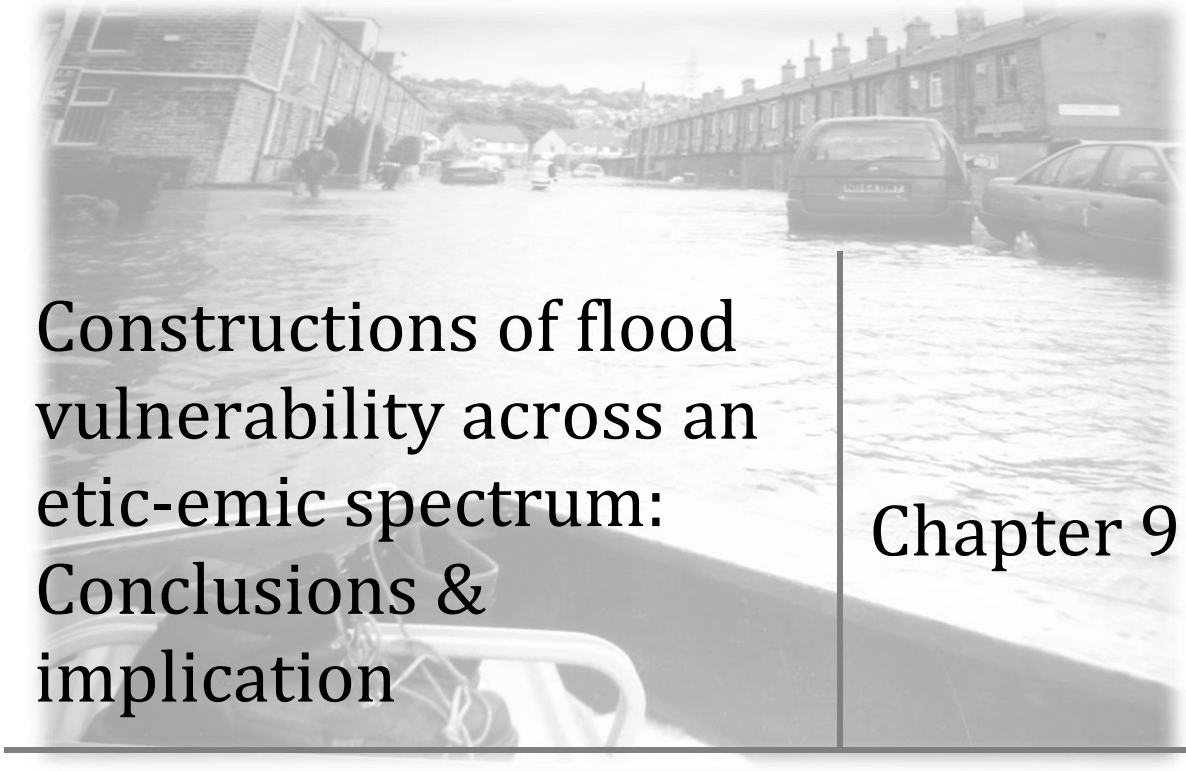
This chapter sought insight into the construction of vulnerability from an emergency management perspective, and how this in turn, shapes professionals' views on people's abilities to respond and recover from flooding (RQ2). Analysis of the literature available to emergency professionals and interview data, has documented how the constructions of physical and social vulnerability inform the identification of 'vulnerable people' between different professional groups. Crucially, the importance of *perspective* has been highlighted, given the shifts between 'the day-job' and 'duty role' of emergency professionals, as well as the transitions between the phase of emergency management and different scales of decision making. The notion of "insiderness" has been critically examined and attention drawn to the problematic nature of this assessment (RQ3). Simultaneously, the importance of "*professional outsiderness*" has been stressed. From this, it is argued that future research examining emergency management in this context, might be better steered through alternative heuristic notions of "professional insiderness" or even "outsidernes", rather than "insiderness".

An interesting tension has been raised from this analysis between notions of *social equity* and *vulnerability*. Particularly amongst certain blue-light responders, it seems that adopting an equality-attitude towards flood response is more important than targeting response according to the distribution of vulnerabilities. This perspective is shaped by the recognition that vulnerability is highly variable at the household scale and therefore requires responders to be open-minded and reactive to the situation at-hand. However, this raises concern that responders are unwilling to embrace the notion of inequalities and may be reluctant to develop more sensitised approaches for emergency responses; a need which has been emphasised in other studies (e.g. Fordham, 2004). This is something that warrants further attention.

On the basis of this research, there are a number of recommendations which could facilitate more meaningful assessments of vulnerability in practice. Firstly, it is argued that interactive and malleable forms of vulnerability assessments may be more suitable for accommodating the influence of different place and hazard contexts, upon constructions of vulnerability.

Moreover, this could go some lengths towards meeting the different requirements of emergency professionals and provide the flexibility required to suit different scales of decision making and emergency management activities.

Secondly, it is suggested that the integration of professional subjectivity in the selection and weighting of indicators for vulnerability mapping, is arguably more meaningful than academic objectivity in such assessments. Furthermore, this approach could minimise the potential of "blind-users" of vulnerability information and facilitate more active engagement in vulnerability amongst *interested* responders. In turn, this may also help currently non-interested responders to engage with vulnerability. This discussion is developed further in Alexander et al. (2013) and continued in the following chapter.



Constructions of flood vulnerability across an etic-emic spectrum: Conclusions & implication

Chapter 9

CONTENTS

9.1 INTRODUCTION

At the start of this thesis it was argued that some form of conceptual clarity is required to organise and better understand the diverse and contested intellectual space of vulnerability research. Building upon the distinction between *etic* ("outsider") and *emic* ("insider") orientated-research introduced in other disciplines, this thesis developed a conceptual framework to examine the extent to which these different orientations result in different constructions of vulnerability. This was firstly considered from an academic perspective and it was argued that academic constructions of vulnerability are steered by etic-emic orientated epistemologies and methodologies (Chapter 2). However, whilst this approach clarified divisions in research, it raised an important question about the role played by research participants in this process. Indeed, just as the researcher adopts a position that is *etically* or *emically* orientated, it stands to reason that research participants will also maintain different degrees of conceptual distance or proximity towards the experience of flooding and their insight into flood vulnerability. From this standpoint the notion of "insiderness" was introduced. To address this, vulnerability has been investigated from the perspective of;

- **Residents**, including those within and outside objective definitions of risk and vulnerability (Chapter 5 & 6)

- **Professionals** concerned with Flood Incident Management (FIM), who must identify and act upon vulnerability in an emergency situation (Chapter 8)

The methods outlined in Chapter 4 and Chapter 7 sought to elicit the potentially different constructions of vulnerability articulated within and between these groups. This chapter brings these findings together and examines the extent to which these insights may be aligned across the etic-emic spectrum (research question 3). The chapter concludes by evaluating the knowledge contribution of this research and implications of the research findings.

9.2 VULNERABILITY FROM THE PERSPECTIVE OF RESIDENTS IN AT-RISK COMMUNITIES

RQ1: How is vulnerability constructed and experienced by residents in locations at risk of flooding? What are the variables influencing self-declared vulnerabilities? What are the implications of self-declared vulnerabilities?

This first research question was addressed in this thesis through a number of etic and emic-orientated research methods. Whereas the findings from quantitative analysis of the *flood risk awareness questionnaire* and *post-interview questionnaire* are mainly etic-orientated (Chapter 5); the findings from in-depth interviews and vignette-elicited discussions offer an emic-orientated insight (Chapter 6). Collectively, these findings can be *integrated* and regarded as equally important in addressing the research question.

9.2.1 ETIC-ORIENTATED INSIGHTS

Quantitative analysis of responses to questionnaires demonstrated that the objective boundaries for flood exposure represented in hazard mapping, poorly predict the subjective views of flood exposure held by those sampled in both study sites. This finding substantiates existing research documenting a disparity between the scientific formulation of risk and public understanding (Kasperson et al., 1988; Brown and Damery, 2002; Burningham et al., 2008). Analysis of the *flood risk awareness questionnaire*, revealed that in the Isle of Wight (IOW) study, this was attributed to the normalisation of flooding in the area, as well as a lack of primary experience amongst those sampled. This finding provides support for the "availability heuristic" proposed by Tversky and Kahneman (1974) and arguably explains the low response rate in this case study.

In the Bradford study, the disparity between objective and subjective assessments of flood exposure were attributed to awareness of fluvial flood defences, thus confirming the existence of the "levee bias" (Haynes et al., 2008). This finding demonstrates that the complex mechanisms between fluvial and pluvial flooding in the area are poorly understood (Section 3.4.1). Further analysis revealed that households with child dependents reported higher estimates of flood exposure, providing further support for the role played by emotions in constructions of risk (Sjöberg, 1998; Harries, 2008). Reported differences between property-

types and employment suggest that income and class may also be relevant for understanding the saliency of flooding within the context of daily life. Finally, there was evidence to suggest that reported estimates of flood exposure are higher in households with two so-called vulnerable characteristics. This finding potentially reflects the influence of social norms and existing research documenting how appraisals of risk may be lessened in those who do not consider themselves to conform to established norms of a 'vulnerable person' (Poumadére et al., 2005).

Further analysis revealed that residents' attitudes towards flood exposure are important for understanding self-declared vulnerabilities. Analysis of qualitative responses in the questionnaire revealed that some residents evaluate personal vulnerability in the context of flood likelihood in both study areas. Although there was no quantitative evidence to suggest that declared vulnerabilities vary across households with different socio-demographic characteristics, social-centric reasons were provided in qualitative responses as reasons for being vulnerable.

The *post-interview questionnaire* also revealed that certain socio-demographic characteristics are relevant for understanding coping self-efficacy and recovery self-efficacy, as well as declared risk. Variables that emerged as significant included the elderly, child dependents, income, insurance and health status (see Table 5.10). Interestingly, significant differences also emerged in recovery self-efficacy and declared vulnerability, between households located within areas of different vulnerability and deprivation; according to the etic-orientated indices of the Social Flood Vulnerability Index (SFVI, Tapsell et al., 2002) and the Index of Multiple Deprivation (IMD, DCLG, 2008). This analysis showed that these socio-demographic characteristics are relevant for understanding self-declared vulnerabilities.

In addition, there was further evidence demonstrating the role played by dispositional characteristics; including optimism-pessimism, locus of control, fatalism and different coping strategies. This questionnaire examined the notion of *proactive coping*, introduced in positive psychology (Aspinwall and Taylor, 1997; Greenglass and Fiksenbaum, 2009). Although previous studies have mainly focused on reactive coping in the aftermath of a hazard event (i.e. how the individual compensates loss or alleviates harm); it was argued that *proactive coping* could also be relevant and affect how flood events are managed and experienced (Aspinwall and Taylor, 1997). This study used several items from the Proactive Coping Inventory (Greenglass and

Fiksenbaum, 2009). While recognising that omitting items invalidates the psychometric qualities of the original questionnaire, only a sample of questions were used from each subscale to allude to this potential influence, rather than conclusively demonstrate it.

A constellation of research findings were produced by examining the sample as a whole and between those objectively exposed or not exposed to flooding. Pessimism was reported in residents exposed to pluvial flooding (Bradford) who declared themselves as vulnerable, though there was mixed evidence concerning the implications of this finding. On one hand, pessimism was linked to positive attitudes towards accepting household responsibility in FRM. On the other, those who declared themselves as vulnerable were less likely to adopt *preventative coping*, suggesting that they are less likely to act in advance of a threat (this was also observed in the sample as a whole). In contrast, fatalism emerged in the analysis of the sample exposed to fluvial flooding. Although fatalism is often represented as a maladaptive behaviour, those declaring themselves as vulnerable were less likely to adopt *avoidance coping*. In the IOW study, optimism and favourable attitudes towards risk responsibility were reported by residents who do *not* consider themselves to be vulnerable. Furthermore, across all samples, traits for strategic, preventative and avoidance coping, and instrumental support seeking (i.e. asking others for advice), emerged in the analysis of coping and recovery self-efficacy.

This analysis has furnished somewhat contradictory insights into the influence of dispositional characteristics upon self-declared vulnerability, risk and self-efficacy. Nonetheless, it is clear that such individual differences are relevant and warrant further attention and could help tailor communications with the at-risk public. This is discussed in further depth in Section 9.5.

9.2.2 EMIC-ORIENTATED INSIGHTS

In-depth interviews and vignette-elicited discussions facilitated exploration into the underlying constructions of vulnerability, shaping the views recorded in the post-interview questionnaire. Qualitative analysis documented evidence for three main constructions of vulnerability, informing residents' evaluations of personal vulnerability and the vulnerability of others. These may be described as *hazard-centric, social-centric* and *existential* constructions of vulnerability (Figure 6.1). A number of variables and processes emerged as influential to these constructions and self-declared vulnerabilities; such as "symbolic markers" on the landscape, flood

characteristics (e.g. causality), socio-demographic characteristics and resources of coping (e.g. social networks). Crucially, it was found that those objectively defined as vulnerable (e.g. elderly, single parents, tenants etc.; see Chapter 2) do not necessarily associate themselves with this category. People uphold multiple identities and evaluate (and weight) different personal qualities in their constructions.

Emergent from this analysis, is the important role played by constructions of "the vulnerable other". Evident in both case studies is how residents appraise their personal risk and vulnerability in relation to an "other", either associating or dissociating themselves from this real or illusionary individual. *Othering* describes a process whereby the individual dissociates from the "vulnerable other", thereby *distancing* or *removing* vulnerability (or risk) from the self. Analysis demonstrated how this "vulnerable other" may be spatially, temporally, socially or existentially identified. Observations of existential insecurities amongst these residents supported the argument that othering may be partly motivated by the need to preserve *ontological security* and minimise the anxiety and doubt created by personal or vicarious experiences. Previous research has applied this theory to the study of risk perception and attitudes towards property mitigation, but has yet to be documented in the context of flood vulnerability (Harries, 2008). Othering may also be explained in the context of local knowledge, a lack of personal experiences of flooding and the "levee bias" (relevant to the Bradford study only). Importantly, othering seems to occur amongst those objectively identified as at-risk and vulnerable to flooding. Whilst it is not desired that the public should feel vulnerable to flooding, arguably there is a need for residents to acknowledge their potential to be vulnerable. Indeed, existing research has shown that this is important for adopting precautionary behaviours (Weinstein and Lyon, 1999). In this context, "othering" could create a barrier to household resilience as residents' reject their risk status. Strategies for raising awareness of risks and encouraging householders to adopt partial-responsibility in FRM, will need to take this into account.

RQ3: Is it possible to infer degrees of "insiderness" and define insider-outsider boundaries amongst research participants? To what degree does *insiderness* influence constructions and declarations of vulnerability? Can these be aligned to the etic-emic spectrum?

"Insiderness" was examined as a possible explanatory variable to clarify and explain observed variations in declared vulnerability and other findings reported in Chapter 6. "Insiderness" was assessed across three axes for *flood exposure*, *experience* and *awareness* and thus represented within a conceptual three-dimensional space. This was approached *objectively* by the

researcher, using scientific formulations of exposure, and *subjectively* to integrate residents' views concerning these axes. In the Bradford study, this was further split to represent insiderness towards fluvial and pluvial flooding.

In the Isle of Wight study, insiderness was found to be a poor predictor of declared vulnerability, though spatial othering of vulnerability was found to occur within the "informed-insiders". Overall, the majority of this sample did not consider themselves to be at risk of flooding and often dissociated from constructs of the "vulnerable other". In contrast, insiderness appeared to be a good predictor of declared vulnerabilities in the Bradford study, with "insiders" more likely to recognise their potential to be vulnerable. However, also observed within the "insider" and "informed-insider" groups were tendencies towards spatial and temporal othering, detachment from visual (symbolic) markers and assumption that the area is now "risk free" in the context of fluvial flood defences. Moreover, the evidence to suggest that othering is partially driven by existential motivations in the pursuit of ontological security emerged within these groups.

On one hand, it is desired that residents objectively exposed to flooding should at least constitute *informed-insiders* and be aware of their exposure. However, *othering* may be an inevitable process occurring within those most knowledgeable, potentially experienced and 'objectively' aware of their risk. It seems that this group is most likely to reject their risk status and articulate risk and vulnerability as a condition belonging to other people and places. Regardless of insiderness, it was also found that the majority of those interviewed in both study areas, did not consider pluvial flooding to be relevant to them, contrary to the scientific modelling conducted for these locations (Allitt et al., 2009; Chen et al., 2010). A number of variables accounted for this finding, such as the lack of personal pluvial flood experience; the "levee bias" (Bradford only); the "availability bias" created by frequent flooding (IOW only); and hazard characteristics (e.g. depth, duration, causality), meaning that such events are discounted. These findings raise a number of implications for FRM and future assessments of vulnerability, and are discussed further in Section 9.5.

9.3 VULNERABILITY FROM THE PERSPECTIVE OF EMERGENCY PROFESSIONALS

RQ2: How is vulnerability constructed by emergency professionals? How do these constructions shape identities of vulnerability and professionals' expectations of people's ability to respond and recover from flooding?

Several methods were employed to elicit emergency professionals' perspectives of vulnerability (as outlined in Chapter 7). Contents analysis of the literature available to these professionals constituted an etic-orientated method and revealed a number of insights into the representation of vulnerability and "vulnerable people". These insights were examined in further depth through emic-orientated methods; namely semi-structured interviews and cognitive interviews facilitated by a GIS-based flood risk assessment tool, "KEEPER".

An important observation is that no explicit distinction is made between different types of vulnerability within professional documents, even though there are nuances in the description of vulnerability in these texts. Fundamentally, these constructions of vulnerability are concerned with those "*less able to help themselves during the circumstances of an emergency*" (HM Government, 2008). Implicit distinctions are made between those *physically* and *socially* vulnerable to flooding; these were further described in this study as discourses of critical and non-critical vulnerability, respectively. Crucially, this distinction is understood within the time-constrained nature of emergency response, only. Physical vulnerability, is concerned with the susceptibility of certain social groups towards physical harm and indicates a discourse on "*critical"* vulnerabilities; this is a matter for operational response, where the primary aim is to protect human life. From this perspective, vulnerable people are identified as those limited in their physical mobility and with an existing medical dependencies. Interviews with professionals demonstrated that this clear and concise construction of vulnerability fits the operational need for clarity, which is essential given the time-constrained nature of decision making in emergency response.

Social vulnerability is concerned with what might be terms as "*non-critical*" vulnerabilities that may place an added strain on responding agencies during operational response (e.g. faith, religious and cultural groups); or may signify those regarded with a lower capacity to recover (e.g. elderly and other groups previously mentioned). This construct of vulnerability is often discussed as secondary to physical vulnerability. Noticeably, the term 'vulnerability' seems to

be displaced in professional documents in the context of recovery and humanitarian assistance, as the scope for who may need assistance is widened. Participants from emergency management departments responsible for coordinating recovery efforts, identified those lacking social networks, financial resources, young families and single parent households as more vulnerable in the aftermath of flooding.

Although similar characteristics of 'vulnerable people' are discussed by all responders and are recurrent in the literature, it is important to observe that the underlying rationale informing professional views on who is vulnerable, varies across the phases of emergency management. Moreover, professionals themselves acknowledged the problematic nature of the "vulnerability". It is recognised that vulnerability may be interpreted differently between different emergency professionals, or applied too broadly that it becomes meaningless. The implications of this finding are examined further in Section 9.5.

Whilst a number of "vulnerable" characteristics are identified, professionals are cautioned in professional literature against "stereotyping" and regarding these characteristics as a guarantee of vulnerability. This is especially emphasised at the household-scale, where vulnerability is conceived as highly variable. Efforts are concentrated on protocols for data sharing across multiple agencies and encouraging the public to self-declare vulnerability or make responders aware of vulnerable others. During semi-structured and cognitive interviews, a select number of professionals expressed uneasiness with labelling people as vulnerable, thereby heightening reliance upon the public to self-declare their vulnerability. In light of the emergent findings from resident interviews and the notion of "othering", this could mean that some people "fall through the gaps" as they don't acknowledge their vulnerability and therefore don't receive the help that they might need.

Several interviews with representatives for the police and the fire and rescue service, also demonstrated a reluctance to distinguish certain groups as more vulnerable than others. Instead, these responders argued that anyone exposed to flooding is potentially (physically) vulnerable; thus vulnerability is regarded as akin to hazard exposure. Further analysis demonstrated that this mind-set facilitates flexible constructions of vulnerability and reactive thinking, recognising that individuals not commonly defined as vulnerable may become vulnerable in a flood situation. This finding reflects the nature of operational roles and responsibilities of the police and fire and rescue, who are primarily involved in rescue and

evacuation operations. Understandably, the physical vulnerability of the population at-risk is a central concern. At the strategic scale of decision making, participants from the fire and rescue service described the need to consider the vulnerability of the infrastructure exposed to flooding and how (physical) vulnerability may spread with the loss of critical services (e.g. electricity, telecommunications and water). Although these groups express a primary interest in hazard information (i.e. location and severity of flooding) and not vulnerability *per se*, the physical vulnerability of the exposed population is an implicit concern. This seeming reluctance to embrace vulnerability and aspects of social inequalities, is something that warrants further study. Previous research has argued the need to challenge masculine command-and-control structures and sensitise emergency response to the different needs of certain social groups (e.g. women) and embrace "equitable inequalities" (Fordham, 2004). However, these findings indicate a potentially significant barrier to this.

The extent to which the hazard informs constructions of vulnerability was also examined. Predominantly, it seems that vulnerability is regarded as a generic condition affecting the same social groups regardless of hazard etiologies. However, a select number of participants from emergency management departments expressed how the identity of the 'vulnerable people' might change in different hazard contexts or at times of interacting hazards. From these insights, recommendations were made for improving current assessments of vulnerability in practice.

RQ3: Is it possible to infer degrees of "insiderness" and define insider-outsider boundaries amongst research participants? To what degree does *insiderness* influence constructions and declarations of vulnerability? Can these be aligned to the etic-emic spectrum?

In the context of emergency management, the insider-outsider distinction is problematic, as emergency professionals adopt multiple personae as their perspectives shift between the "day job" and "duty role". It was argued that insiderness can be assessed across two axes, depending upon the *phase of emergency management* and *scale of decision making*. However, given the definition of insiderness as the conceptual proximity or distance from the *experience* of flooding (and flood vulnerability), it was agreed that professionals cannot be classed as "insiders". Instead, "informed-insiders" were argued to be those responders working closely with affected communities; either in the operational response phase of an event at the site of the incident, or in adjacent activities in community planning and mitigation. It is these

responders that can offer first-hand insights into how flooding is being experienced by those affected.

However, whereas discussions of residents' insiderness prompts debates about the desired level of insiderness, this is not applicable in the professional context. In fact, professional "*outsiderness*" is equally valuable. This is important for strategic decision making during emergency response and developing emergency plans that can be enacted in multiple contexts. Adding to the complexity of this gradient, professionals inherently accrue experiences as careers progress through a hierarchy of roles and responsibilities. In this context, professional "outsiders" may in fact have first-hand experiences and be more knowledgeable than those currently working within the "insider" domain.

Returning to the third research question of this thesis, it was concluded that whilst it is possible to infer insiderness, it is inherently problematic. Moreover, constructions of vulnerability cannot be so easily aligned to this gradient, given the diversity of perspectives adopted by professional participants. From this, it is argued that future research examining emergency management in this context, might be better steered through alternative heuristic notions of "professional insiderness" or even "outsidernes", rather than "insiderness". However, in this study the concept of "insiderness" has been useful for understanding the different needs and interests in vulnerability information. This holds implications for advancing the assessment of vulnerability in practice and is further discussed in the Section 9.5.

9.4 ALIGNING CONSTRUCTIONS OF VULNERABILITY TO THE ETIC-EMIC SPECTRUM

This analysis shows that the application of emic-orientated research methods does not necessarily result in emic insights into the phenomenon under study. Participants vary in their degree of "insiderness" and the extent to which they can shed insight into the experience of flooding and flood vulnerability. The third research question and overall aim of this study was to examine the extent to which these perspectives can be aligned to the etic-emic spectrum. In the context of research participants, this was examined through the notion of "insiderness". Whilst the "fuzzy" nature of insider-outsider boundaries has been emphasised throughout this thesis, Table 9.1 aligns some of the main findings observed in the research to the "insiderness" / etic-emic gradient.

Table 9.1: Aligning research findings to the "insiderness" / etic-emic gradient

Emic **← "Insiderness" gradient →** ***Etic***				
	Insider	**Informed-insider**	**Informed-outsider**	**Outsider**
RESIDENTS				
Key characteristics	▪ Flood experienced ▪ High awareness of flooding ▪ Objectively exposed to flooding ▪ OR subjectively believes themself to be exposed to flooding	▪ May have experience of flooding ▪ Awareness of flooding ▪ Objectively exposed to flooding, but to a lower degree than "insiders" ▪ OR subjectively believes themself to be exposed to flooding	▪ May have experience of flooding ▪ Limited awareness of flooding; alternatively has a high awareness of flooding, but does not consider themselves to be exposed to flooding ▪ Objectively exposed to flooding, but to a lower degree than "informed-insiders"	▪ No experience of flooding ▪ No awareness of flooding ▪ Not objectively exposed to flooding ▪ OR subjectively does not consider themself to be exposed to flooding ("self-elected outsiderness") (Limited sample of outsiders)
Construction of vulnerability and related findings	▪ Existential constructions of vulnerability ▪ Social othering – though more likely to associate with "other" than outsider groups (Bradford study) ▪ Experiential constructions of vulnerability ▪ Temporal and spatial othering of vulnerability and risk (partially driven by ontological insecurity) ▪ Detachment from visual ("symbolic") markers and assumption area is "risk free" ▪ Tendency towards existential insecurities attached to visual markers	▪ Existential constructions of vulnerability may be evident ▪ Social othering – though more likely to associate with "other" than outsider groups (Bradford study) ▪ Experiential constructions of vulnerability likely ▪ Temporal and spatial othering vulnerability and risk (partially driven by ontological insecurity) ▪ Tendency towards existential insecurities attached to visual markers	▪ Social othering – greater tendency to dissociate than other groups ▪ Experiential constructions of vulnerability less likely; dominance of normative influences ▪ Tendency towards existential securities attached to visual markers ▪ Spatial othering of risk (not driven by ontological insecurity, but informed by other reasons e.g. "availability")	Limited sample of outsiders. Findings based on individual axes of insiderness: ▪ Dominance of normative influences in social-centric vulnerability ▪ Spatial othering of risk (this may be accurate to objective assessments of flood exposure, but may be *uninformed*) ▪ Existential securities attached to visual markers

Emic **← "Insiderness" gradient →** ***Etic***				
	Insider	**Informed-insider**	**Informed-outsider**	**Outsider**
EMERGENCY PROFESSIONALS				
Key characteristics	N/A	▪ Operating at the operational scale of decision making ▪ Duty role conducted at the site of the incident; involves interaction with the affected public ▪ Accumulated professional experience, based on interactions with the affected public ▪ Interaction with community in planning or awareness raising activities ▪ Close involvement in recovery and interaction with public	▪ Operating at the tactical scale of decision making ▪ Duty role conducted at the site of the incident, but concerned with coordinating response efforts (i.e. does not involve direct interaction with the public) ▪ Involvement in recovery and interaction with public	▪ Operating at the strategic scale of decision making ▪ Duty role conducted off-site (i.e. away from the incident) ▪ May have limited experience in operational response ▪ No professional interaction with the public ▪ Recognition that "outsider" may be more knowledgeable than "informed-insider", given accumulation of experience
Construction of vulnerability (using *emergency response* as an example)	N/A	▪ Hazard-centric exposure, implicitly linked to *physical vulnerability* of population ("critical vulnerabilities") ▪ Less prescriptive in characteristics of vulnerable people due to need for reactive and flexible thinking ▪ Reliance of self-declared vulnerabilities ▪ Social vulnerability relevant to recovery (non-critical)	▪ Similar to informed-insider during operational response, though target known vulnerable households (pre-existing vulnerabilities) ▪ May be directed by strategic decisions to target physical vulnerability of infrastructure ▪ Non-critical social vulnerability relevant for indicating added demand on response	▪ "Bigger picture", beyond individuals per se ▪ Attention to physical vulnerability of infrastructure (implied interaction with critical, physical vulnerability of population), extending beyond hazard boundaries ▪ Non-critical social vulnerability relevant for indicating added demand on response

9.5 CONTRIBUTION TO KNOWLEDGE

This thesis reinvigorates the etic-emic debate previously conceived in cross-cultural psychology and anthropology, and applies this discussion to the context of flood vulnerability. Building upon a limited body of existing research (e.g. Fielding and Fielding, 2008), this thesis takes the etic-emic distinction a step further. Firstly, a conceptual framework is presented to clarify the multiply contexts in which these terms may be applied and their relevance to epistemology, methods and constructions of knowledge (Figure 2.4). Rather than relying upon the context to suffice (Berry, 1999), this framework encourages researchers to clarify their etic-emic orientation throughout the research process. Moreover, the importance of envisioning these orientations across a gradient or spectrum (rather than as a binary relationship) is strongly emphasised; in so doing, the unique and equally-valuable contributions from these standpoints is stressed. To date, there has been little effort to conceptualise how existing research is positioned across the etic-emic gradient, or to examine the extent to which these different orientations result in different academic constructions of vulnerability. This was addressed in Chapter 2.

Taking the etic-emic distinction another step forward, this research critically examines the extent to which this debate can be conducted in terms of research participants themselves. Whilst emic-orientated research necessitates identification of "insiders", this study challenges the extent to which this is possible. In agreement with Young (2005), this thesis has emphasised the challenge of identifying "insiders" and importance of not assuming and imposing a shared, homogenous identity upon a group of individuals. Instead, the notion of "*insiderness*" is proposed. In turn, this research analyses the extent to which "insiderness" influences participants' constructions of vulnerability, as well as predicts self-declared vulnerabilities amongst residents in selected case studies. Looking beyond the geographical boundaries of flood hazard or socio-demographic characteristics of the household, this research documents the cumulative effect of experience, awareness and constructions of exposure upon residents' constructions of vulnerability. Here, compelling evidence emerged concerning processes of "*othering*", a theory previously developed in discourses of social exclusion and identity (Section 6.5) and shown to be equally applicable here. Collectively, this research contributes to the wealth of vulnerability knowledge, emphasising the socially constructed nature of vulnerability (Blaikie et al., 1994: Heijmans and Victoria, 2001; Fordham, 2004) and sheds insights into why some people embrace their vulnerability where others reject it. In particular, attention is drawn to the different types of constructions held by the

public and emergency professionals, and the variables shaping these constructions of vulnerability.

A strong emphasis has been placed throughout this thesis concerning the importance of thinking in terms of *construction* rather than *perception*. Although "perception" is firmly established in the context of risk, Section 2.3.2 observed the misleading nature of this term. Despite acknowledgement in the literature that risk is socially constructed, it seems that authors have continued to uncritically apply the term "perception". It is argued here, that a concerted effort should be made to emphasise the active way in which risk and vulnerability are *constructed*. In this context, the underlying process of construction is emphasised and is as important (if not more so) than the resulting estimates of risk and vulnerability.

Returning to the notion of "academic constructions" of vulnerability, one might question where this thesis is aligned to etic-emic spectrum presented in Chapter 2. To some extent, one might argue that this thesis constitutes an informed-etic, as it represents an outsider's interpretation and construction of participants' world views; moreover, participants themselves varied in their degree of "insiderness". On the basis of methods and epistemology this thesis is aligned towards the centre of this spectrum, with insights provided from both etic and emic-orientated research methods.

Noticeably absent from this thesis is the journey of researcher and reflections on positionality, which has been intentionally side-lined in the written content of this thesis (and only briefly discussed in Chapter 4). This decision was justified on the basis that a vast body of research already exists on this subject matter, whereas critical reflections concerning the "insiderness" of research participants is lacking in the literature. Whilst the decision was made to somewhat 'silence' the researcher, in practice discussions of the researcher positionality and participant insiderness go hand-in-hand. As the researcher intuitively draws upon his or her personal or professional insiderness (or outsiderness) to facilitate conversations, the participant also negotiates their insiderness; adapting their insider/outsider positions in response to certain questions or research methods, and sharing more or less information with the researcher, for example. It is important to acknowledge that this process occurs between researchers and participants in the mutual creation of knowledge.

Although this research has shown that it is *possible* to infer boundaries of "insiderness" amongst research participants, it is important to question the extent to which it is *advisable*. The main criticism of this approach concerns the language itself and meanings conveyed in discussions of "insiders" and "outsiders". In terms of participants, these terms may on the surface prompt impressions that one group is more or less knowledgeable than the other, which as this research has shown is not necessarily the case. This is particularly problematic in the context of professional participants as it might imply uninformed decision making. In the context of at-risk communities, this could potentially lead to the domination/subordination of certain voices over others. Similarly, within research communities it is possible that the insider-outsider (emic-etic), debate could continue discussions of epistemological supremacy. To overcome these concerns, this thesis has emphasised the notion of a spectrum and stressed the equal importance of knowledge contributions across this gradient. From this standpoint, etic-emic orientations in epistemology, methodology and constructions of knowledge are conceived as complementary rather than competitive. Future researchers are also encouraged to continue this debate in this fashion.

9.6 IMPLICATIONS FOR FLOOD RISK MANAGEMENT & FUTURE ASSESSMENTS OF VULNERABILITY

One of the goals of this thesis was to consider the ways in which future assessments of vulnerability may be more meaningfully informed. Chapter 1 outlined how policy recommendations for flood vulnerability are emphasising the importance of moving-beyond the socio-demographic identification of vulnerable groups and enabling households and communities to identify and define the risks, vulnerabilities and resilience relevant to them (Twigger-Ross and Scrase, 2006; Twigger-Ross and Colbourne, 2009). This approach advocates the use of local networks and participatory forms of community engagement.

In this research, it is also argued that participatory forms of knowledge exchange are essential for enhancing the co-production of knowledge, empowerment and ownership of FRM (Vogel et al., 2007). The participatory model arguably presents a more democratic approach, appreciating different types of knowledge (i.e. multiple experts) and the contexts in which knowledge is embedded (Brown and Damery, 2002; Alexander et al., 2013). However, caution must be exercised. The "insiderness" of residents within an area may change through *external* interaction with 'experts' (e.g. the Environment Agency), but may also change through *internal*

interaction with others. Observations of "othering" evident in this research were mainly observed amongst insider groups; yet this group may exert the 'louder' voice within a community, given their "insider" knowledge and previous experience. In participatory activities tensions may be created between external and internal voices, and within this internal space as some residents embrace their potential vulnerability and others reject it. These tensions could create barriers and opportunities to risk communication depending upon the way in which this is managed. Notions of accuracy and inaccuracy are inappropriate. Instead, what is required is a dialogue that appreciates the origins of conflicting views and draws attention to the various perspectives that might exist and use these to meaningfully inform communication.

For instance, evidence suggesting that *othering* may occur in some residents in the pursuit of ontological security, could be used to tailor risk (and vulnerability) communication in a way that is less threatening. In the Bradford study, constructions of control were shown to be important in residents' constructions of risk, hazard-centric vulnerability and linked to existential (in)securities. If flooding is communicated in a way that conveys a sense of controllability, then this may go some lengths towards easing ontological insecurities and potentially minimise *othering* tendencies. Crucially, this sense of control needs to resonate at the household scale if householders are to accept more responsibility in FRM; otherwise, control is merely transferred by proxy onto the state (as demonstrated in the Bradford study).

There is a possible concern that "othering" reduces residents' willingness to participate in discussions of flooding. Indeed, this was evident in the low response rate in the IOW study. Interestingly, this was not the case in Bradford. Although some of the flood experienced residents displayed risk and vulnerability othering, they were empathetic, eager to participate and motivated to be helpful to others (i.e. the "vulnerable other"). In this context, othering does not necessarily present a barrier to participation.

Another important question concerns who should be involved within FRM activities; indeed is it important for "outsiders" to participate? Depending on how "insiderness" has been defined, outsiders may include those not objectively exposed to flooding, or it may include those who do consider themselves to be at-risk. Clearly, in the latter context it may be even more important that outsiders should be involved in participatory activities. More broadly, it has been argued that situating flooding within the context of other local issues and priorities may

enhance a community's receptiveness to information (Marsh et al., 2004; Coates, 2010). In this light, participatory activities should try to engage all members of the community and not discriminate on the basis of residents' insiderness to flooding. Moreover, the impacts of flooding may extend beyond the physical boundaries of flood waters and impact the wider community.

In terms of spatial othering, Chapter 6 considered the potential opportunity and barriers for using visual markers in raising risk awareness. On one hand, such markers could preserve landscapes of risk (e.g. extent of past flooding) and potentially minimise tendencies towards othering. On the other, enforcing such boundaries could heighten existential insecurities and encourage othering motivated by ontological insecurity. Moreover, analysis in this research suggests that such symbolic markers can constrain people's ability to think flexibly about other types of flooding and flood events beyond representations of the past. Markers therefore enforce flood norms and biases created by "availability" and "affect" (Weinstein et al., 2000; Keller et al., 2006; Haynes et al., 2008). At the same time, there is a need to increase awareness of other, non-traditional types of flooding (Fernandez-Bilbao and Twigger-Ross, 2009).

Implications also emerged concerning *living flood histories* (e.g. McEwan et al., 2012). It was argued that there is a need to consider the potentially detrimental impact of communicating flood frequencies and this was linked to temporal othering. Reported distinctions between floods regarded as "natural" and "man-made", also highlight the importance of preserving flood causality in these histories to minimise conspiracy stories and the potential for some floods to be disregarded in constructions of risk and vulnerability.

This research has demonstrated the importance of *othering* processes in residents' constructions of vulnerability. However, it is not the case that socio-demographic characteristics are unimportant. Indeed, quantitative analysis presented here, has shown that these characteristics are relevant for explaining differences in self-efficacy (coping and recovery). Moreover, qualitative analysis has also demonstrated that such characteristics are influential to social-centric and existential constructions of vulnerability.

In the context of emergency professionals a number of recommendations can be made for improving assessments of vulnerability. Firstly, it is argued that professionals may benefit from

a more concerted effort to distinguish the different facets of vulnerability under discussion (i.e. physical, social, critical and non-critical). This recommendation comes from the observation that the underlying rationale justifying these characteristics of 'vulnerable people', is varied depending upon the phase of emergency management and task at hand. In this context, the 'vulnerable groups' identified during operational response, are not necessarily the same as those who may be vulnerable in the aftermath of a flood event. A generic "one size" fits all definition is clearly inappropriate.

Secondly, cognitive interviews revealed the potential value of offering interactive and malleable forms of area-wide vulnerability assessment to interested responders (particularly LA emergency management). This method not only encourages active engagement with indicators/indices and minimises the potential risk of "blind users" of such tools, but also provides the flexibility potentially required for different place and hazard contexts. Arguably, methods that enable professionals to construct their own indices of vulnerability and weight indicators according to their subjective importance in decision making, is more meaningful than objective, equal-weighted models. Furthermore, this approach is amenable to the different requirements of emergency professionals and scales of decision making, and is therefore adjustable to *professional insiderness* or *outsiderness* as required. Although the value of area-wide indicator mapping is restricted in the context of operational response, indicators could provide a useful tool in the context of wide-spread flooding, requiring strategic decision making and priority-setting; as well as adjacent activities in planning and mitigation (Alexander et al., 2013). Moreover, interactive assessments of vulnerability could go some lengths in engaging those responders seemingly less interested in vulnerability and help promote more sensitive emergency response practices.

9.7 AVENUES FOR FUTURE RESEARCH

The limitations of this research were acknowledged in Section 4.7. Given the small sample size, this study does not claim to be representative of the population exposed to flooding as a whole. Furthermore, this research has been conducted in two selected case studies, where fluvial-pluvial (Bradford) and tidal-pluvial (IOW) flood mechanisms exist. In addition, the Bradford case study has recently been defended against fluvial flooding. These case studies thus capture a range of flood contexts that exist elsewhere and to which these findings may also be applicable. The focus on case studies is fundamental for this type of in-depth research

and offer exemplars for understanding that make an important contribution to knowledge (Flyvbjerg, 2006). However, further research is warranted in other flood contexts (different types of flooding or non-defended place) and socio-cultural settings, to examine the extent to which the processes observed in this study occur elsewhere. Beyond flooding, constructions of vulnerability should also be examined for other hazard types (e.g. adverse weather and heatwaves), to which the population is also exposed.

Future research is required to continue the etic-emic debate and the notion of "insiderness/outsiderness". In this study, participants were not consulted for their views on this concept or how they might align themselves across this gradient. Moreover, the current methods for determining insiderness assume an equal weighting in importance between axes, which may not be the case in reality. Indeed, in directly consulting participants about this, new axes for insiderness may emerge. To extend the insights presented here, it is important that research is conducted with other relevant stakeholders, such as voluntary and private sector actors who are also involved in flood recovery, but were not sampled in this research.

Chapter 6 presented evidence for processes of attachment and detachment from visual ("symbolic") markers on the landscape. Furthermore, it was observed how heavy rainfall and surface water transfer residents' attentions towards known sources and locations of flooding. In the complex setting of the Bradford study, there is another possible dimension to this finding not explored in this research about whether certain visual markers are *preferenced* over others. Here, "*preferencing"* may be defined as the process through which individuals consciously or subconsciously attach symbolic meaning onto one visual marker, over another. For example, in the Bradford case study, model outputs actually depict how surface water accumulates and ponds against the levee for fluvial flood protection; thus the levee system is simultaneously a *potential* symbol for safety and concern. Interestingly, this was not discussed amongst participants, which may reflect a lack of recent storm events contributing to surface water accumulation, or potentially a deeper process towards *preferencing* visual symbols. In this instance, the levee system in the Bradford town may be *preferenced* over surface water 'puddles', to signify security over insecurity, or vice versa. This is an under-researched theme in the context of complex hazard settings and is highlighted here as an area worthy of further investigation.

Also not fully explored in this research, is the influence of *proactive coping* in shaping the experiences and recovery from flooding. The study has alluded to the possible importance of this, but further research is required to understand how *positively-motivated* coping can enhance people's abilities to anticipate, react and minimise the negative impacts that result from flooding.

Chapter 2 positioned vulnerability in the context of resilience, coping capacity and adaptive capacity and argued that vulnerability constitutes an entry point for understanding social-environmental interactions. However, it must also be acknowledged that vulnerability is becoming less politically fashionable in resilience-orientated agendas (Chapter 1). This research has emphasised the importance of understanding residents' constructions of vulnerability and how self-recognition of vulnerability is needed to encourage adoption of responsibility and precautionary behaviour. In this context, it is argued that vulnerability should be embraced alongside resilience in FRM activities. Moreover, in the light of future climate projections and predicted increases in the frequency and severity of flooding, vulnerability is likely to remain an important field of research.

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APPENDIX A

Supporting documents for questionnaire methods & analysis

CONTENTS

A1 FLOOD RISK AWARENESS QUESTIONNAIRE – SUPPORTING DOCUMENTS

A1.1 FLOOD RISK AWARENESS QUESTIONNAIRE

SECTION ONE

This first section asks for some details about you and your Household and any previous flood experience that you may have had. The reason for asking some personal details is to try to understand 'who makes up a household' and whether this household might be deemed as vulnerable to the impacts of flooding. All these details will be kept anonymous and confidential in this research.

0 = No Data

1. Male[1] ○ Female[2] ○ Gender

18-25[1] ○ 26-45[2] ○ 46-65[3] ○ 66+[4] ○ **2.** Age

3. What is your position in the household? *Please tick.*

I live alone[1]	
I live with a spouse/partner, but without children[2]	
I live with a spouse/partner, with children[3]	
I live with my immediate family and wider family members (e.g. grandparents)[4]	
I am a single parent[5]	
I share a house or flat[6]	
I live with multiple families[7]	

4. How long have you lived in the property?
Please tick.

Less than 1 year[1]	
More than 1 year but less than 5 years[2]	
5 to 10 years[3]	
More than 10 years[4]	

5. The property is:

Owned (out-right)[1]		
Mortgaged[2]		
Rented	Private [3]	
	Social housing [4]	
Other[5]		

6. Is the property covered by (home) contents and / or buildings insurance?

	Home	Buildings
YES[1]		
NO[2]		

7. How many people live in the property? _____

8. Are there any persons under 18 years of age?

YES[1] ☐ NO[2] ☐

If yes, please indicate how many under 18's are in each of the following age groups:

0 to 3 years[1]	
4 to 7 years[2]	
8 to 12 years[3]	
13 to 18 years[4]	

9. Are there any persons over the age of 75 years?

YES[1] ☐ NO[2] ☐

10. Does anyone in the house suffer with a long-term illness, health problems or disability which limits their daily activities?
(This may be mental or physical, please note any details offered by the respondent).

YES[1] ☐ NO[2] ☐

11. What is the main language spoken in the home?

.....

{If the answer is English please progress to Q.13.

12. Can one or more members of the household:

	Yes[1]	No[2]
Understand spoken English		
Speak English themselves		
Read English		

13. How would you describe your ethnicity and the ethnicity of other members of the household?
Please tick, more than one is allowed.

White	White British[1]	
	White Other[2]	
	White Mixed: Black Caribbean[3]	
	White Mixed: Black African[4]	
	White Mixed: Asian[5]	
	White Mixed: Other[6]	
Asian or Asian British	Indian[7]	
	Pakistani[8]	
	Bangladeshi[9]	
	Other Asian background[10]	
Black	Black British[11]	
	Caribbean[12]	
	African[13]	
	Other[14]	
Chinese	[15]	
Other	[16]	

14a. How would you describe the religious beliefs of members of the household?
Please tick, more than one is allowed.

No Religion[1]	
Christian[2]	
Buddhist[3]	
Hindu[4]	
Muslim[5]	
Sikh[6]	
Jewish[7]	
Other[8]	

14b. Where a religion has been selected is this member/ these members of the household actively involved within their religious community? (e.g. attend prayer, religious-focused activities)

YES[1] ☐ NO[2] ☐

15. What is the occupation of the main income-provider for the household?

.....

16. Can you please indicate which one of the following represents your household income, per year?

A	Less than £10,000[1]	
B	£10,000 to £20,000[2]	
C	£21,000 to £30,000[3]	
D	£31,000 to £50,000[4]	
E	£51,000 or more[5]	
F	I would rather not answer[0]	

Questions concerning household flood experience

By 'flooding' I mean overflowing water from rivers; rainfall running off the garden or street; or overflowing drains (not burst pipes or leaking appliances inside the home).

17. In your opinion, on a scale of 1 to 5, with 1 being very unlikely and 5 being very likely, what is the likelihood of your home being flooded?
(Water must enter the house)

Please circle

1	2	3	4	5
Very unlikely		Neither likely nor unlikely		Very likely

18. Are you registered with the Environment Agency's flood warning service?

YES[1] ☐ NO[2] ☐ DON'T KNOW[3] ☐

19. This question is interested in your household's experience with flooding: *Please tick*

Our home has been flooded (includes under the floorboards, basement or cellar) ONCE ONLY[1]	☐
Our home has been flooded (includes under the floorboards, basement or cellar) MORE THAN ONCE[2]	☐
Our garage has been flooded, but not the property[3]	☐
Our garden has been flooded, but not the property[4]	☐
Our street has been flooded, but not the property[5]	☐
We have experienced flooding before, but NOT at this property[6]	☐
We have never experienced flooding[7]	☐

*If the answer is no experience then please progress to question **24**. Those who have experienced flooding but not at this property should still be considered.*

20. Since living here, how many times has the property been flooded?

☐

21. Have you ever evacuated your property due to a flood event?

YES[1] ☐ NO[2] ☐

22. Please indicate on a scale of 1 to 5 your level of agreement with each of the following statements: *1 strongly disagree, 3 neither agree nor disagree, 5 strongly agree*

	1	2	3	4	5
Flooding has had a significant financial impact on this household					
Flooding has had a significant emotional impact on this household					
Our experience of flooding means we are more aware of local flood risk					
If another flood was to occur we would know what to do to minimise losses to our property					
Our flood experience means we now pay more attention to the weather and/or drains					
Since experiencing flooding we now feel that we should take an active role in managing the risk to our property					

{If the respondent begins to discuss their flood experience please note these details in the side margins/reverse of the paper.}

23. Does this property currently have any flood protection measures in place to protect your home from flooding?
(e.g. air bricks covers, flood guard, water pumps, flood insurance).

YES[1] ☐ NO[2] ☐

If no, why do you not have flood protection measures in place?

I did not know about flood protection options[1]	
I knew about some options but could not see the benefit[2]	
I knew about some options but could not afford them[3]	
I knew about some options but did not know where I could purchase them[4]	
I do not think it is my responsibility to protect this property[5]	
I do not think flood protection is applicable to me: This property is not at flood risk[6]	
Other[7]	

24. *As a household,* can you think of anything that might make you *vulnerable* if a flood was to occur?
By 'vulnerable' we mean what might make it difficult for you to respond, cope or recover from a flood event.

……
……
……

SECTION TWO

In this final section I would like to ask some questions about your local community and wider awareness of flood issues.

25. In your opinion, on a scale of 1 to 5, with 1 being very unlikely and 5 being very likely, what is the likelihood of flooding in [insert town name]?
Please circle

1	2	3	4	5
Very unlikely		**Neither likely nor unlikely**		**Very likely**

26. Are you aware of any history of flooding in the area? *Please give details*.

YES[1] ☐ NO[2] ☐ ……
……
……

27. In your opinion, what could be the main causes of flooding in this area?

……
……
……

28. Are you aware of any flood protection measures / defences in this area? *Please give details.*

YES[1] ☐ NO[2] ☐ ……
……
……

29. Who do you think is responsible for managing flood events? *Please tick the appropriate box, more than one box may be ticked.*{Yes[1] / No[2]}

Central Government	☐
Emergency Services	☐
Environment Agency	☐
Local Authority	☐
Local community groups	☐
Water company	☐
Yourself	☐
Other	☐
I do not know	☐

Thank you for taking the time to complete this questionnaire. Your help is very much appreciated. We will send you some information in due course to let you know how your response has been helpful in the research.

This research has been approved by the ethics committee at Middlesex University and accords to the guidelines outlined by the Social Research Association. Part of the ethical requirement is that participants give their written consent and permission for us to use their responses to this questionnaire for the purposes of this research. I would be grateful if you can read the following statements and enter your initials in the appropriate box.

1. I have agreed to take part in this study and I am happy for my responses to this questionnaire to be used within this project

2. I confirm that I have had the opportunity to ask questions and understand the purpose of this research

3. I understand that my responses to this questionnaire will be kept anonymous and confidential

4. I understand that my participation is voluntary and that I am free to withdraw at any time, without giving any reason

5. I agree that this form that bears my name and signature may be seen by a designated auditor

_____ _____ _____

Name of Participant Date Signature

****

Next year we would like to interview some of the local residents to discuss some of these questions in more detail. This would involve us coming to your house or arranging a location to meet and would take approximately 1 hour of your time. It would be very helpful for our research. Would you be willing to take part in this?

YES / NO

If yes, please note down a contact telephone number or email address.

HOME:
MOB:
EMAIL:
I would prefer to be contacted via:

NOTE: This consent form will be detached from each questionnaire.

SECTION THREE - Researcher observations

Type of property

Detached[1]	
Semi-detached[2]	
Terrace house[3]	
Bungalow[4]	
Ground floor flat[5]	
Basement flat[6]	
Other[7]	

Observations for the drive-way:

There is no drive-way[1]		The drive-way is concrete, brick, marble[5]	
The drive-way is grass or gravel[2]		Steps up to the front door[6]	
The property has no drive-way, but has a front garden[3]		The property has both a drive-way and a front garden[7]	
The entrance to the property is on an rising slope[4]		The entrance to the property is on a downhill slope[8]	

END OF QUESTIONNAIRE

A1.2 RRESULTS FROM THE BRADFORD CASE STUDY

{AVAILABLE ON REQUEST]

A1.3 RRESULTS FROM THE ISLE OF WIGHT CASE STUDY

{AVAILABLE ON REQUEST]

A2 POST-INTERVIEW QUESTIONNAIRE – SUPPORTING DOCUMENTS

A2.1 POST-INTERVIEW QUESTIONNAIRE

This research is interested in the extent to which people feel they manage/could manage flood risk and the potential impacts from flooding.

SECTION 1

This first section asks for some details about you and your household and any previous flood experience that you may have had. The reason for asking some personal details is to try to understand 'who makes up a household' and whether these characteristics are related to people's perception of flood risk and feelings about coping with the potential impact of flooding. <u>All these details will be kept anonymous and confidential in this research.</u>

ABOUT YOU

1. Your Gender — Male[1] ○ Female[2] ○

2. Your Age — 18-25 [1] ○ 26-45 [2] ○ 46-65 [3] ○ 66+ [4] ○

3. How would you describe your position in the household? *Please tick.*

I live alone	1	
I live with a spouse/partner, but without children	2	
I live with a spouse/partner, with children	3	
I live with my immediate family and wider family members (e.g. grandparents)	4	
I am a single parent	5	
I share a house or flat	6	
I live with multiple families	7	

ABOUT YOUR PROPERTY

4. How long have you lived in the property?
Please tick.

Less than 1 year	1	
More than 1 year but less than 5 years	2	
5 to 10 years	3	
More than 10 years	4	

5. The property is:

Owned (out-right)[1]		
Mortgaged[2]		
Rented	Private 3	
	Social housing 4	
Other[5]		

6. How would you describe your property?

Detached	1	
Semi-detached	2	
Terrace house	3	
Bungalow	4	
Ground floor flat	5	
Basement flat	6	
Other	7	

7. How many bedrooms are there? ☐

8. Is the property covered by (home) contents and / or buildings insurance?

	Home	Buildings
YES 1		
NO 2		
Don't know		

ABOUT YOUR HOUSEHOLD

9. How would you describe your ethnicity and the ethnicity of other members of the household? *Please tick, more than one is allowed.*

White	White British[1]	
	White Other[2]	
	White Mixed: Black Caribbean[3]	
	White Mixed: Black African[4]	
	White Mixed: Asian[5]	
	White Mixed: Other[6]	
Asian or Asian British	Indian[7]	
	Pakistani[8]	
	Bangladeshi[9]	
	Other Asian background[10]	
Black	Black British[11]	
	Caribbean[12]	
	African[13]	
	Other[14]	
Chinese	[15]	
Other	[16]	

10. What is the main language spoken in the home?

.....

11. How many people live in the property? ☐

12. Are there any persons under 18 years of age? YES[1] ☐ NO[2] ☐

If yes, please indicate how many under 18's are in each of the following age groups:

0 to 3 years [1]	
4 to 7 years [2]	
8 to 12 years [3]	
13 to 18 years [4]	

13. Are there any persons over the age of 75 years?

YES[1] ☐ NO[2] ☐

14. Does anyone in the house suffer with a long-term illness, health problems or disability which limits their daily activities? (*i.e. Individual requires help to perform daily tasks, such as cleaning, shopping etc.)*

YES[1] ☐ NO[2] ☐

15. Do you own a vehicle?

YES[1] ☐ NO[2] ☐

16. What is the occupation of the main income provider?

……

17. Please indicate whether this is full time or part time (if applicable):

FULL TIME [1]	
PART TIME [2]	

ABOUT YOUR COMMUNITY

18. On a scale of 1 to 5 how would you rate living in [town name] (1 being "I really dislike living in [town name]", 5 "I really like living in [town name]")

1	**2**	**3**	**4**	**5**
Really dislike				*Really like*

19. How easy can you get help from your neighbours if you need it? *(please circle)*

Very easy *easy* *possible* *difficult* *very difficult*

20. How many people do you feel you could count on if you had a serious problem? *(please circle)*

None 1-2 3-5 5+

FLOOD AWARENESS AND EXPERIENCE

21. Before this interview, were you aware that you live in a flood prone area?

YES[1] ☐ NO[2] ☐

22. Have you ever experienced flooding in this property?

YES[1] ☐ NO[2] ☐

23. Are you registered with the Environment Agency's flood warning service?

YES[1] ☐ NO[2] ☐ DON'T KNOW[3] ☐

24. What do you think could be a cause of flooding in the area? *(you* may tick more than one)

River	☐	Failing drains	☐	Other	☐
Heavy Rainfall	☐	Don't know	☐		☐

25. Are you aware of any flood defences within the area?

YES[1] ☐ NO[2] ☐

26. Does at least one person in the household know what to do in the case of a flood?

YES[1] ☐ NO[2] ☐

27. Have you protected your house against flooding? YES[1] ☐ NO[2] ☐

28. Would you expect support in the case of a flood? YES[1] ☐ NO[2] ☐
If yes, who would provide this support?

Local authority	☐	Water company	☐
Environment Agency	☐	Community groups	☐
Central Government	☐	Friends and family	☐
Emergency Services	☐	Other	☐

SECTION 2

In this section, I would like you to rate the extent to which you agree with a series of statements. The statements relate to your attitudes and feelings in general. *The scale is 1 to 4:*

1. I strongly agree 2. I agree 3. I disagree 4. I strongly disagree

Statement	Level of agreement			
	Strongly agree			Strongly disagree
	1	**2**	**3**	**4**
It is best not to set your hopes too high since you will probably be disappointed				
Rarely do I expect good things to happen				
I generally look at the brighter side of life				
I generally make light of my problems				
Where there's a will there's a way				
I have a tendency to blow up problems so they seem worse than they really are				
Every cloud has a silver lining				
Most of what happens in life is just meant to be				
I am a take charge person				
I try to let things work out on their own				
I imagine myself solving difficult problems				
I imagine every possible outcome to a problem before I try to tackle it				
I often find ways to break down problems into manageable components				
I make a list and try to focus on the most important things first				
I plan for future eventualities				
I prepare for adverse events				
Information I get from others has often helped me to deal with my problems				
I ask others what they would do in my situation				
I know who can be counted on when the chips are down				
When I have a problem I usually like to sleep on it				

Please rate the extent to which you agree with a series of statements. The statements relate to how you would feel if a flood was to occur and water entered your property.

Statement	**Level of agreement**			
	Strongly agree			Strongly Disagree
	1	**2**	**3**	**4**
I do not require the help of others to support daily activities				
My age does not limit me				
Money would not be a problem (e.g. if I ever was flooded and needed to stay elsewhere or needed to redecorate etc.)				
I am in good health				
I do not have dependents to think about (this may include children, an elderly relative or friend – either in the household or within the local community.				
I have a lot of social support (friends, family, neighbours and community groups)within the area and nearby				
I have a lot of social support (friends, family) outside the area				
If I received a flood warning I would try to protect my property				
If I received a flood I would know what to do to protect my property				
I do not consider myself to be at risk from flooding				
I do not consider myself/household to be vulnerable to flooding				
If my property were to flood I/we would be able to cope				
If my/our property flooded, I/we would soon bounce back to normal				
Flooding is just something that happens: you live with it and move on				
There's nothing we can do to prevent flooding				
There are more things in daily life to be concerned about than the potential risk of being flooded				
Flooding is not a major concern for this household				
It is not my/our responsibility to manage the potential flood risk to this property				
Flooding in the UK is likely to become more of a problem in the future				
As a household, we should be more responsible for managing the flood risk to our property				

END OF QUESTIONNAIRE

A2.2 RESULTS FROM BRADFORD CASE STUDY

{AVAILABLE ON REQUEST]

A2.3 RESULTS FROM IOW CASE STUDY

{AVAILABLE ON REQUEST]

A3 FOLLOW-UP QUESTIONNAIRE

Thank you for taking the time to participate in this research, which is interested in the extent to which people feel they manage/could manage flood risk and the potential impacts from flooding. This short questionnaire is very similar to the questionnaire that you completed as part of our interview. The final section of this questionnaire asks you for some feedback on the interview process.

SECTION 1

1. In this section, I would like you to rate the extent to which you agree with a series of statements. The statements relate to your attitudes and general outlook on life and flooding specifically .*The scale is 1 to 4:*

1. I strongly agree 2. I agree 3. I disagree 4. I strongly disagree

Statement	**Level of agreement**			
	Strongly agree			Strongly Disagree
	1	**2**	**3**	**4**
I do not require the help of others to support daily activities				
My age does not limit me				
I am in good health				
I do not have dependents to think about (this may include children, an elderly relative or friend – either in the household or within the local community.				
I have a lot of social support (friends, family, neighbours and community groups) within the area and nearby				
I do not consider myself to be at risk from flooding				
If I received a flood warning I would try to protect my property				
If my/our property flooded (i.e. water enters the property), I/we				

Statement	**Level of agreement**			
	Strongly agree			Strongly Disagree
	1	**2**	**3**	**4**
would soon bounce back to normal				
Flooding is just something that happens: you live with it and move on				
There's nothing we can do to prevent flooding				
You can get through anything providing you have a strong support network (i.e. friends, family, neighbours or community groups)				
If I received a flood I would know what to do to protect my property				
I have a lot of social support (friends, family) *outside* the area				
There are more things in daily life to be concerned about than the potential risk of being flooded				
I do not consider myself/household to be vulnerable to flooding				
It is not my/our responsibility to manage the potential flood risk to this property				
If my property were to flood I/we would be able to cope				
Flooding in the UK is likely to become more of a problem in the future				
If a flood occurred we would support each other as a community				
Households who consider themselves to be vulnerable should make themselves known to *local authorities*				
Households who consider themselves to be vulnerable should make themselves known to *the local community*				
As a household, we should be more responsible for managing the flood risk to our property				
Flooding is not a major concern for this household				

SECTION 2

Sometimes flood risk managers will look at the census data to understand the make-up of a community in a potential flood risk area and whether there are communities which might be considered as *vulnerable* (either during or after a flood event).

2. To what extent do you agree with the use of social indicators (based on the UK census) in flood risk management? *Please circle.*

Strongly agree **Agree** **Disagree** **Strongly disagree**

3. The table below lists a series of potential indicators – Please select the indicators which you feel are most relevant for identifying vulnerable communities. *You may select more than one answer.*

Elderly people (75 years or more)	
Single parent households	
Young families	
Long-term illness	
Disability	
No insurance	
Unemployment	
Financial deprivation	
No access to a vehicle	
Living alone	
Non-home owners	
Other (please list)	
I do NOT think indicators are relevant	

4. In your opinion, what do you feel can help people to cope with the impact of being flooded (either before, during or after a flood event has occurred)?

……

……

……

SECTION 3: Your feedback

In this section, I would like you to consider the interview process itself.

5. How easy did you find it to voice your opinions and feelings towards flooding?

Very easy **Easy** **Difficult** **Very difficult**

6. Did you feel that your opinions and feelings mattered?

YES ☐ NO ☐ DON'T KNOW ☐

7a. Do you think it is important to discuss flooding in the context of other local (and national) issues?

YES ☐ NO ☐ DON'T KNOW ☐

7b. Did you feel you were able to discuss flooding within the context of other issues that matter to you?

YES ☐ NO ☐ DON'T KNOW ☐

8. To what extent do you feel the interview has raised your awareness of flood related matters?

A lot **Somewhat** **Not at all**

9. Please comment on the use of the story cards.

Statement	Level of agreement			
	Strongly agree			Strongly Disagree
	1	**2**	**3**	**4**
The stories helped me to consider the issues that other households may face when confronted with flooding				
I felt I could relate to the characters in the story				
The stories helped me to imagine myself in 'their shoes' and how I would behave in that situation				
I could identify the details which may have made the characters vulnerable (either before, during and after the flood event)				
I could identify the details which may have helped the characters to cope with a flood event (either before, during and after the flood)				
The discussion, questionnaire and the stories helped to break-up the interview process				
The discussion, questionnaire and the stories made the interview process more interesting				

10. Please note any further comments or feedback:

……

……

……

THIS IS THE END OF THE QUESTIONNAIRE. **THANK YOU.**

END OF APPENDIX A

APPENDIX B

Supporting documents for in-depth interviews with resident participants

CONTENTS

B1 INTERVIEW THEMES

- Discuss subject's opinion of living in the area.
    - Focus on the positive aspects to begin with – what do they like about living here?
    - Is there anything the subject doesn't like about living in the area?
    - Prompts: personal safety, crime, "community" and neighbours
    - {Does "flooding" naturally emerge in these discussions? Where is it situated within the context of local issues/risks?}

Progress to flooding:

- Is the subject aware of the flood history of the area?
- Has they experienced (personally or witnessed) flooding before? Do they know someone who did?
- What are the main causes of flooding in the area?
- Are they aware of surface water/pluvial flooding? Hotspots areas? {Observe where flood risk is placed in relation to them personally}
- Are they aware of local flood defenses or any work that has been carried out in the area that they think may be linked to flood mitigation? How has this changed views on personal risk?

- Does the subject consider themselves to be at *risk* from flooding? If yes, were they aware of this risk when moving to the property? If no, why not?
- Do they consider themselves to be *vulnerable* to flooding? {Present context first and observe initial responses to "vulnerable"}
- If a flood was to occur, is there anything that might make them vulnerable? {Explore reasons for yes and no response. If prompt required, orientate towards 'struggle'}. What is the basis of their answer? (e.g. personal experience? Observe? Media?)
- Is there anyone in the local area (without naming names) who they would consider to be vulnerable to flooding? A "vulnerable person" in general? Why?

- If a flood was to occur, is there anything that might make them personally resilient? Able to cope and bounce back? {Steer through the different phases of the flood cycle}
- In general, what does the subject feel helps people to cope in situations of flooding? Difficult/challenging experiences in general? If personally experienced with floods, can the participant discuss how they got through that experience?

- Does the subject have a view on flooding in the UK, is it changing?
- What are their attitudes towards FRM and notion that people may have to learn to 'live with flooding'? Should households be more responsible?
- Is the subject aware of any property-level mitigation options and measures that a household can take to mitigate risk? Do they have any of these measures in place? Would they ever consider these as an option?
- Introduce the notion that sometimes flood risk managers/decision makers will look at area-wide indicators for vulnerability: What is the subjects view about the use of indicators? What indicators do they feel would be relevant for assessing vulnerability?

{*Progress to questionnaire and vignettes*}

B2 SUMMARY OF RESIDENT INTERVIEWEES

Interviewee ID	Age bracket	Gender	Marital status	Position in household	Occupation	Tenure	Residency	Flood experience
1	46 to 65 yrs	Male	Married	Lives with wife and 2 children	Full time Carer	Mortgage	More than 10 yrs	Experienced flood in 2000
2	47 to 65 yrs	Female			Disability living allowance			
3	66+ yrs	Female	Widow	Lives alone	Retired	Owned	More than 10 yrs	Experienced flood in 2000; primary witness to flood in 1966
4	66+ yrs	Female	Married	Lives with spouse/partner, without children	Retired	Owned	More than 10 yrs	Experienced flood in 2000
5	66+ yrs	Male						
6	66+ yrs	Female	Married	Lives with spouse/partner with their (adult) son	Retired	Owned	More than 10 yrs	Experienced flood in 2000
7	66+ yrs	Male						Experienced flood in 2000 and primary witness to flood in 1947
8	66+ yrs	Male	Married	Lives with spouse/partner without children	Retired	Owned	More than 10 yrs	Experienced flood in 2000. Wife also experienced 1947 flood.
9	26 to 45 yrs	Female	Divorced	Single parent	Full time employment	Mortgage	More than 10 yrs	Experienced flood in 2000
10	66+ yrs	Female	Widow	Lives alone	Retired	Owned	More than 10 yrs	Experienced flood in 2000
11	46 to 65 yrs	Female	Divorced	Lives alone	Retired	Mortgage	More than 10 yrs	Experienced flood in 2000

Interviewee ID	Age bracket	Gender	Marital status	Position in household	Occupation	Tenure	Residency	Flood experience
12	66+ yrs	Female	Single	Lives alone	Retired	Owned	More than 10 yrs	Experienced flood in 2000 & in 1947
13	26 to 45 yrs	Male	Married	Lives with spouse/partner with children	Full time employment	Mortgage	More than 10 yrs	Flood in 2000 (minor damage)
14	18 to 25 yrs	Female	Single	Single parent	Part time employment	Rented (private)	Less than 1 yr	Inexperienced - unaware
15	26 to 45 yrs	Female	Single	Single parent	Full time parent	Rented (private)	More than 1 yr but less than 5 yrs	Inexperienced; secondary witness to flood in 2000
16	26 to 45 yrs	Female	Single	Single parent	Full time parent/ unemployed	Rented (private)	More than 1 yr but less than 5 yrs	Inexperienced; secondary witness to flood in 2000
17	26 to 45 yrs	Female	Single	Single parent	Full time parent	Rented (private)	More than 1 yr but less than 5 yrs	Inexperienced; secondary witness to flood in 2000
18	66+ yrs	Female	Widow	Lives alone	Retired	Owned	More than 10 yrs	Primary witness to fluvial flood in 2000
19	26 to 45 yrs	Female	Single	Single parent	Part time employment	Mortgage	More than 10 yrs	Primary witness to fluvial flood in 2000
20	66+ yrs	Male	Widower	Lives alone	Retired	Owned	More than 10 yrs	Primary witness to fluvial flood in 2000
21	18 to 25 yrs	Female	Single	Lives with spouse/partner with children	Full time employment	Mortgage	5 to 10 yrs	Secondary witness to flood in 2000; primary witness to pluvial flood event
22	26 to 45 yrs	Female	Married	Lives with spouse/partner with children	Full time employment	Mortgage	5 to 10 yrs	Primary witness to pluvial and fluvial floods
23	46 to 65 yrs	Female	Single	Lives alone	Disability living allowance	Rented (private)	5 to 10 yrs	Inexperience; secondary witness to flood in 2000

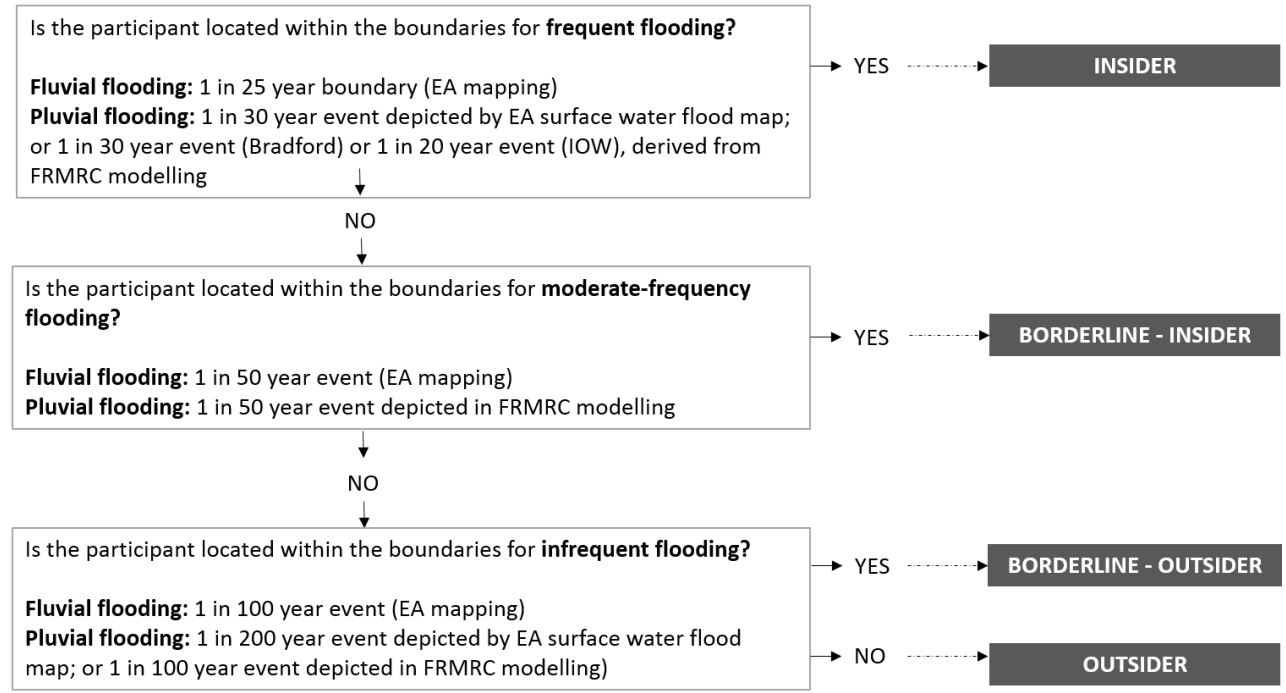
Interviewee ID	Age bracket	Gender	Marital status	Position in household	Occupation	Tenure	Residency	Flood experience
24	46 to 65 yrs	Male		Visiting friend (used to live in the area)				Inexperienced, aware
25	46 to 65 yrs	Male	Single	Lives alone	Full time employment	Mortgage	More than 10 yrs	Primary witness to fluvial flood in 2000
26	46 to 65 yrs	Female	Married	Lives with spouse/partner without children	Full time employment	Owned	More than 10 yrs	
27	46 to 65 yrs	Male						Primary witness to fluvial flood in 2000 & pluvial flood event
28	66+ yrs	Male	Married	Lives with immediate family and wider family members	Retired	Owned	More than 10 yrs	Primary witness to flood in 2000 and 1947; and pluvial event
29	66+ yrs	Female						Primary witness to flood in 2000 and experienced flood in 1947; and pluvial event
30	26 to 45 yrs	Female	Single	Single parent	Full time parent	Rented (social)	More than 10 yrs	Experienced flood in 2000
31	18 to 25 yrs	Female	Single	Lives with immediate family and wider family members	Part time employment	Owned	More than 10 yrs	Experienced flood in 2000
32	46 to 65 yrs	Male	Married	Lives with spouse/partner with children	Unemployed	Rented (private)	More than 1 yr but less than 5 yrs	Primary witness to flood in 2000
33	26 to 45 yrs	Female	Separated	Single parent	Full time parent	Rented (social)	More than 10 yrs	Primary witness to fluvial flood in 2000
Isle of Wight participants:								
34	26-45yrs	Female	Married	Lives with a spouse/partner with	Full-time employment	Owned (mortgage)	5 to 10yrs	Experienced pluvial flooding in current property

Interviewee ID	Age bracket	Gender	Marital status	Position in household	Occupation	Tenure	Residency	Flood experience
				children				
35	66+yrs	Male	Married	Lives with a spouse/partner without children	Retired; voluntary town councillor	Owned	More than 1yr but under 5yrs	Primary witness
36	66+yrs	Female	Married	Lives with a spouse/partner without children	Retired	Owned	More than 10yrs	Inexperienced; primary witness to flooding in town and other local hotspots of surface water/pluvial flooding.
37		Male						
38	26-45yrs	Female	Married	Lives with spouse/partner with children	Full-time employment	Owned (mortgage)	5 to 10yrs	Experienced (minor) pluvial flood in "lightwell" of current property; primary witness to town flooding; awareness of previous pluvial flooding in current property;
39	26-45yrs	Female	Married	Lives with spouse/partner with children	Full-time employment	Owned (mortgage)	Less than 1yr	Inexperienced, unaware
40	46-65yrs	Male	Married	Lives with spouse/partner with children; current property is a second home	Full-time employment	Owned	More than 1yr but under 5yrs	Primary witness to island flooding; inexperienced personally
41	46-65yrs	Male	Divorced	Lives alone	Retired	Rented (private)	More than 1yr but under 5yrs	Primary witness to tidal flooding in the town; inexperienced personally
42	66+yrs	Female	Divorced	Lives alone	Semi-retired	Owned	5 to 10yrs	Primary witness to surface water and pluvial flooding in the town; experienced flooding elsewhere
43	66+yrs	Male	Single	Lives alone	Retired	Owned	More than 10yrs	Primary witness to tidal flooding in the town and on the island. Also redesigned drive-way to divert surface water (but does

Interviewee ID	Age bracket	Gender	Marital status	Position in household	Occupation	Tenure	Residency	Flood experience
								not class this as a flood).
44	46-65yrs	Female	Married	Lives with a spouse/partner without children	Semi-retired	Owned	More than 10yrs	Primary witness to surface water and pluvial flooding; and tidal interaction in the town
45	46-65yrs	Female	Married	Lives with a spouse/partner without children	Full-time employment	Owned (mortgage)	5 to 10yrs	Primary witness to flooding in the town (pluvial/tidal); childhood experience of flooding
46	66+yrs	Female	Widow	Lives alone	Retired	Owned	More than 10yrs	Primary witness to flooding in the town
47	46-65yrs	Female	Partner	Lives with a spouse/partner without children	Full-time employment	Owned (mortgage)	5 to 10yrs	Primary witness to pluvial flooding (current location) and tidal flooding (elsewhere)

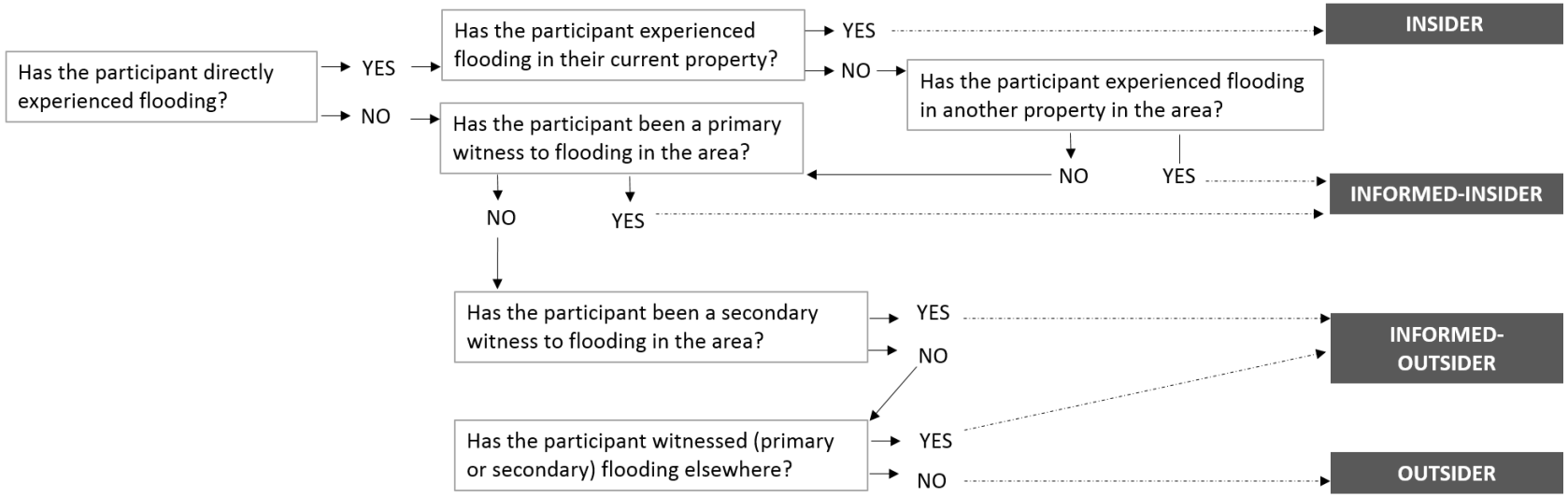
B3 DECISION TREES FOR ASSESSING "INSIDERNESS"

OBJECTIVE METHOD FOR DETERMINING "INSIDERNESS": EXPOSURE DIMENSION



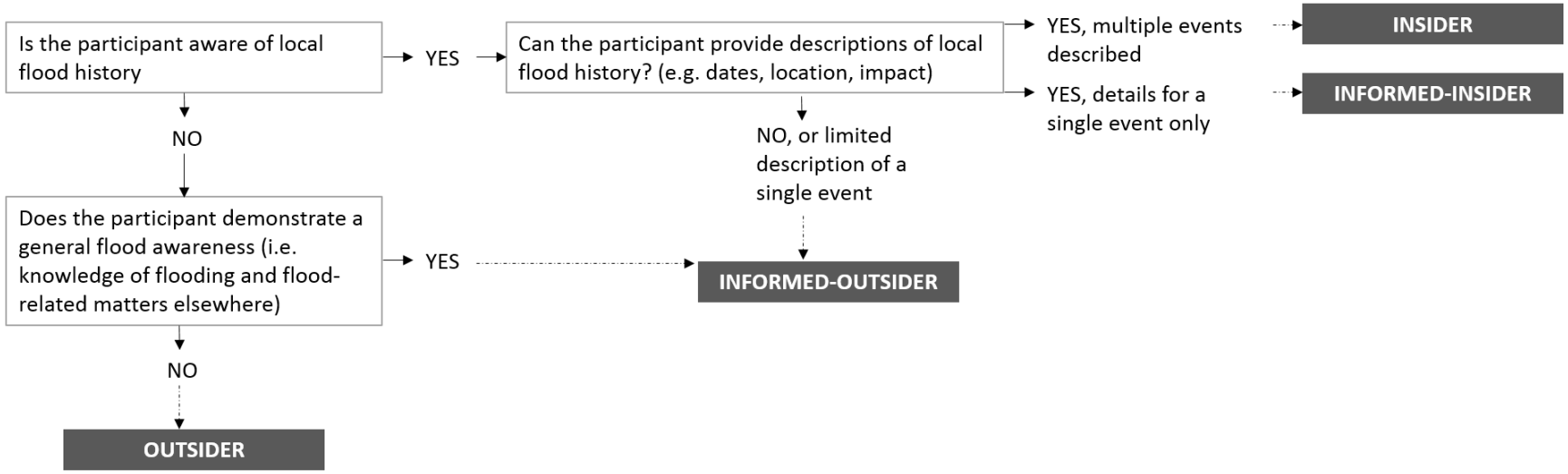
Fluvial flooding applicable to Bradford study only

OBJECTIVE METHOD FOR DETERMINING "INSIDERNESS": EXPERIENCE DIMENSION



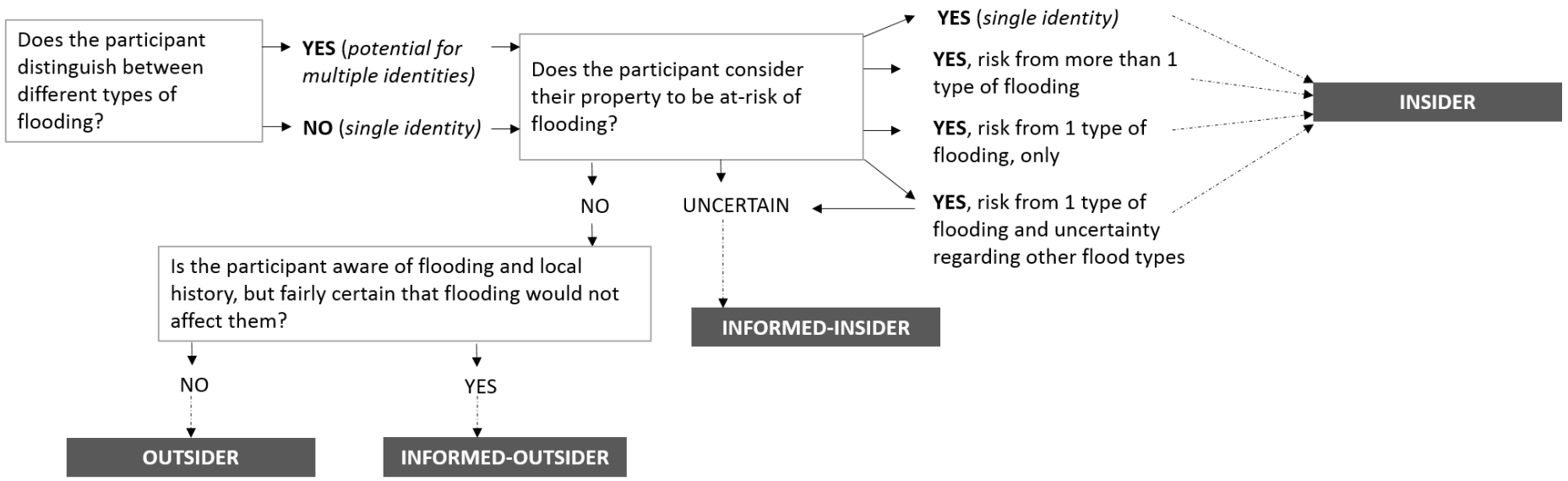
- Repeat for different types of flood
- In cases of multiple experiences, *weight* is given towards direct experiences (e.g. someone who was a secondary witness for one flood event, but experienced another, is coded as an 'insider')

OBJECTIVE METHOD FOR DETERMINING "INSIDERNESS": AWARENESS DIMENSION



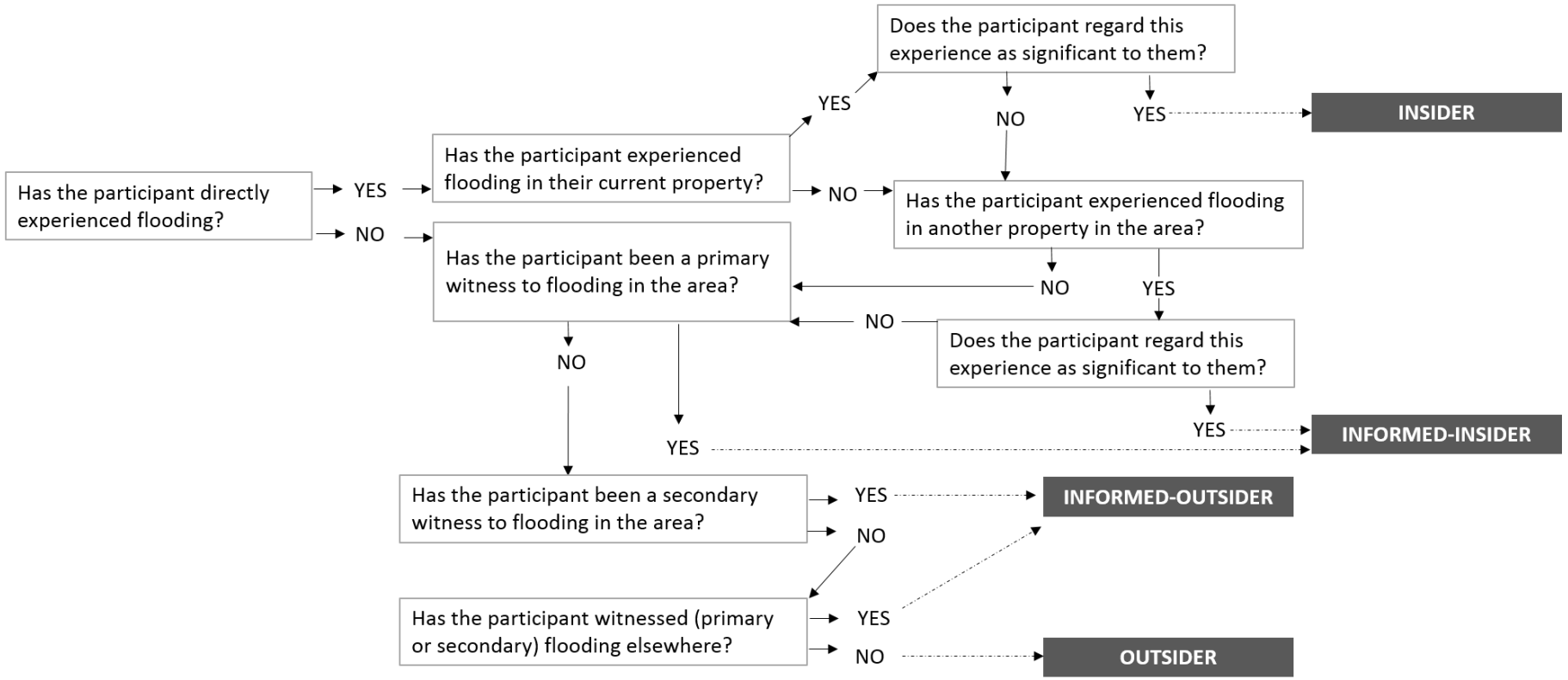
- Weight is given towards local knowledge of flooding
- Repeat for different types of flood

SUBJECTIVE METHOD FOR DETERMINING "INSIDERNESS": EXPOSURE DIMENSION



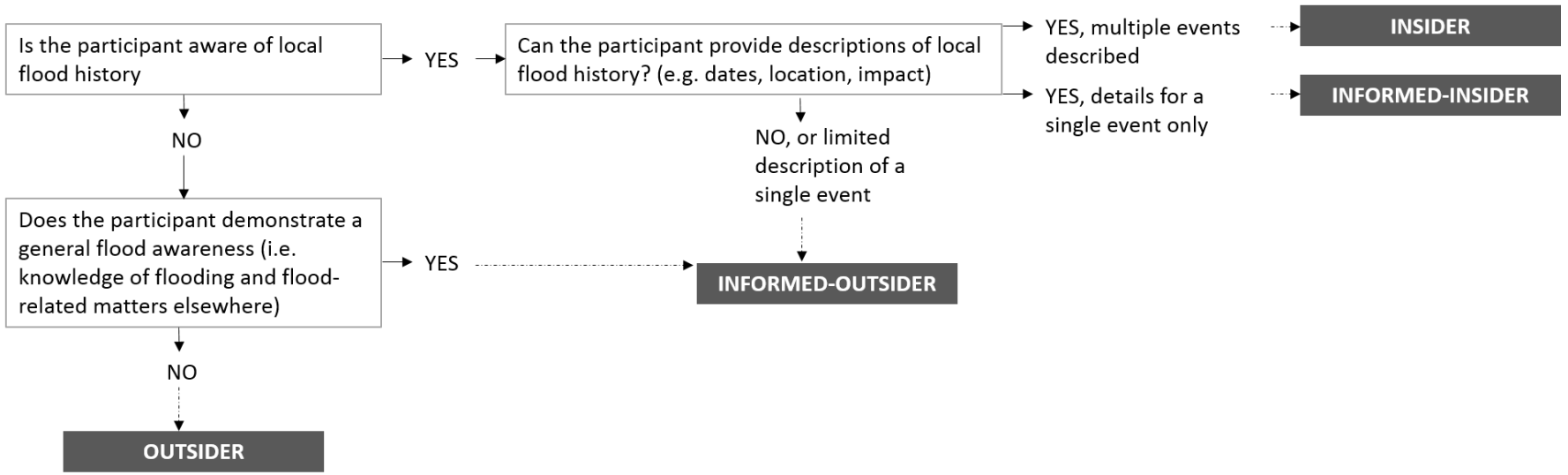
Where multiple identities exist, assign category to flood-type

SUBJECTIVE METHOD FOR DETERMINING "INSIDERNESS": EXPERIENCE DIMENSION



- Repeat for different types of flood

SUBJECTIVE METHOD FOR DETERMINING "INSIDERNESS": AWARENESS DIMENSION



- Weight is given towards local knowledge of flooding
- ***Observe confidence in participant's description/personal-belief in the validity of their knowledge***
- Repeat for different types of flood

END OF APPENDIX B

APPENDIX C

Supporting documents for research with emergency professionals

CONTENTS

C1 SUMMARY OF PROFESSIONAL INTERVIEWEES

Table C1.1: Summary of emergency professionals participating in semi-structured interviews and cognitive interviews*****

Organisation	Team / position	Responsibilities
Hampshire County Council*	Emergency planning and business continuity	Day job: Emergency planning across county and district councils. Duty role: Coordinating response for local scale flooding and will attend strategic coordinating group for widespread flooding as county council representative.
Environment Agency (Hampshire)*	Incident management technical specialist	Day job: Liaising with professional partners for multi-agency flood planning. Duty role: Flood warning and liaison officer for strategic coordinating group.
Environment Agency (Hampshire)	Community engagement officer	Community engagement towards more targeted risk communication and warning (project FloodWise) and developing community flood plans.
Isle of Wight Council (x2)**	Resilience coordinator, emergency planning	Day job: Emergency planning (generic response and flood planning) and compliance with CCA. Duty role: Emergency management duty officers to coordinate liaison, set up adverse weather office, instigate response plan and advise decision makers.
Hampshire constabulary*	Emergency planning officer	Day job: Previously with Hampshire County Council emergency planning. Emergency planning officer for Hampshire constabulary, including planning for major incidents and CCA compliance. Duty role: Tactical advisor and emergency planning advisor in strategic/gold command.
IOW ambulance service	Civil contingencies manager	Emergency planning for ambulance service to ensure compliance with CCA.
Hampshire Fire and Rescue	Contingency planning	Retired officer, now responsible for contingency planning under CCA 2004; includes business continuity to ensure F&R satisfy statutory requirements.
Environment Agency (West Yorkshire) x2**	Flood incident management – includes	Day job: Flood warning service and risk communication and awareness-raising.

Organisation	Team / position	Responsibilities
	a team member and team leader	Overseeing MAFP. Duty role: Flood duty office responsible for issuing flood warnings and liaising with professional partners. Team leader will operate as the Area Base Controller (ABC) with responsibility for general management and overview of response, plus coordination with media.
West Yorkshire Fire and Rescue [Int 1]	Operations response officer	Day job responsibilities for area operational management. Duty role: Command room strategic monitoring of response.
West Yorkshire Fire and Rescue [Int 2] *	Area manager and integrated risk management planning	Risk management planning, including locating areas prone to flooding and allocation of resources. Retired from operational service, but experience with operational and strategic flood response.
West Yorkshire Fire and Rescue [Int 3]	Station manager and assistant district manager, operations and training	Day job responsibilities for station operational management. Duty role: Tactical advisor, with operational responsibilities as duty officer. Also has a special reference as a technical rescue officer in flooding and swift water rescue.
West Yorkshire Fire and Rescue [Int 4]	Station manager, operations preparedness	Day job: responsibilities for station operational management. Duty role: Tactical advisor. Special reference for flood projects including swift water rescue; leading this project for WY.
City of Bradford Metropolitan District Council (CBMDC)*	Emergency planning manager	Emergency planning (including MAFP) and ensuring compliance with CCA. Duty role: Responsibility for command and control during an incident. Coordinating vulnerable lists and rest centres.
West Yorkshire Constabulary*	Custody manager and operations planning	Operations and contingency planning for emergencies. Duty role: Manage the SOR (special operations room) or ECF (emergency control facility) depending on scale of event (strategic versus local scale respectively).
Yorkshire Ambulance service	HART manager, emergency	Manages Hazard Assessment Response Team (HART), responsibility for paramedics and

Organisation	Team / position	Responsibilities
	preparedness	EMTs; towards treating causalities in situations that ambulance service typically can't (e.g. water response). Duty role: Bronze commander or tactical advisor.
Health Protection Agency (West Yorkshire) (x2)	Communicable disease control	Health advice post-flood related to contaminated land and clean-up operations. Advisory agency, mainly for Infectious disease control (e.g. pandemic flu). Expert advisors for strategic incident management.

END OF C1

C2 SUMMARY OF PROFESSIONAL LITERATURE FOR CONTENTS ANALYSIS

Professional document	Author	Purpose of document
Identifying people who are vulnerable in a crisis – Guidance for emergency planners and responders	HM Government (2008)	Non-statutory guidance document
National Flood Emergency Framework for England	Defra (2011)	Information, guidance and key policies for flood emergency planning.
Emergency preparedness: Guidance on Part 1 of the Civil Contingencies Act 2004, its associated Regulations and non-statutory arrangements. - Chapter 5 Emergency Planning	HM Government (2011)	Establishes a generic framework for civil protection. Focused on pre-emergency elements of Integrated Emergency Management.
Emergency response and recovery - Chapter 4 Responding to emergencies - Chapter 5 Recovering from emergencies - Chapter 7 Meeting the needs of those affected by emergencies	HM Government (2012)	Establishes a generic framework for civil protection. Develop a shared understanding of multiagency response and recovery arrangements across responding agencies.
Evacuation and shelter guidance. Non-statutory guidance to complement *emergency preparedness* and *emergency response and recovery*	HM Government (2006)	Non-statutory guidance on evacuation and shelter for local responders and planners.

Professional document	Author	Purpose of document
National recovery guidance (online only, see https://www.gov.uk/national-recovery-guidance#page-navigation)	HM Government (2007)	Best practice and case study examples for recovery guidance.
Humanitarian assistance in emergencies: Non-statutory guidance on establishing humanitarian assistance centres	HM Government (2011)	Strategic document for LRFs to develop an improved coordinated response to humanitarian aspects of an emergency.
Preliminary guidance: Developing a multi-agency flood plan (MAFP)	HM Government, Defra and Environment Agency (2008)	Local Resilience Forum (LRF) to undertake flood response and recovery planning.
Case study documents: Bradford and West Yorkshire		
Multi-agency flood response coordination plan, Bradford	Emergency management team at City of Bradford Metropolitan District Council (2013)	Framework for Council's operational response to flood emergency
Flood Plan: Bradford	Emergency management team at City of Bradford Metropolitan District Council (2008)	Framework for Council's operational response to flood emergency
Bradford generic evacuation plan	Emergency management team at City of Bradford Metropolitan District Council (2013)	This plan provides generic procedures for dealing with incidents which require the evacuation of an area(s) within the Bradford District.
Rest centre and emergency assistance plan	Emergency management team at City of Bradford Metropolitan District Council (2013)	The Rest Centre section of this plan sets out the arrangement for dealing with the reception of evacuees at pre-identified sites, to provide short term accommodation, security, welfare, communication, catering, medical facilities and where necessary, overnight accommodation. The second part of the plan sets out the arrangements for setting up and running an Emergency Assistance Centre (EAC).

Professional document	Author	Purpose of document
Bradford adverse weather plan	Emergency management team at City of Bradford Metropolitan District Council (2013)	To outline the procedure for the distribution of weather warnings within the Council and to define the framework for response to adverse weather incidents. This plan supports the wider multi-agency response to adverse weather incidents.
Emergency response and recovery manual	West Yorkshire Resilience Forum (2010)	The purpose of the West Yorkshire Resilience Forum Emergency Response and Recovery Manual is to define how responding organisations will work together in the event of a declared emergency
Case study documents, Isle of Wight and Hampshire		
Multiagency flood response plan Isle of Wight (MAFP)	Isle of Wight Local Authority, emergency management unit (2011)	Provide relevant information and outline the response arrangements in place for coordinate multi-agency response to flooding.
Hampshire Multiagency flood response plan (Part 1)	Hampshire County Council, emergency planning unit (2012)	Provide relevant information and outline the response arrangements in place for coordinate multi-agency response to flooding.
Hampshire County Council Major Incident Plan and Community Recovery Plan	Hampshire County Council, emergency planning unit (2008)	Framework for Hampshire County Council, outlines command and control system the council will adopt in response; also in context of multi-agency response

Professional document	Author	Purpose of document
Hampshire and Isle of Wight Local Resilience Forum strategic response framework for emergencies	HIOW LRF (2009)	The Strategic Response Framework for Emergencies describes the multi-agency management structures and capabilities in place to respond to emergencies and major incidents in Hampshire and the Isle of Wight.
Hampshire and Isle of Wight Local Resilience Forum community recovery plan	HIOW LRF (2012)	The Hampshire and Isle of Wight Local Resilience Forum (HIOW LRF) Community Recovery Plan describes the multi-agency structures required to provide a coordinated recovery from an emergency.
Isle of Wight Local Authority Emergency Response Plan	IOW Local Authority, emergency management department (2009)	To provide a framework for the Isle of Wight Local Authority to respond to an emergency, as defined by the Civil Contingencies Act (2004).
Isle of Wight Local Authority Rest Centre Plan	IOW Local Authority, emergency management department (2010)	This Plan is intended to primarily provide practical advice for the setting up and management of the Rest Centre.
Isle of Wight Resilience Forum multi-agency flood response plan	IOW LA emergency management (2011)	To provide a framework for the Island Resilience Forum to respond to the risk or situation of a flood emergency, as defined by the Civil Contingencies Act (2004), occurring on the Isle of Wight.

C3 SEMI-STRUCTURED INTERVIEWS WITH EMERGENCY PROFESSIONALS

NOTE: Potential participants were invited via email and informed that the interviews were semi-structured, lasting approximately 1 hour. At the start of each interview, participants were informed that it would be tape recorded with their permission, that their identities would be kept anonymous and of the right to withdraw their responses at any time.

Introduction

As we have discussed in previous emails/phone conversations this interview is part of my PhD research which aims to develop a decision support system (DSS) for flood incident management. The requisite of this DSS is to develop a functional tool that is specifically targeted to the needs of the end-user (i.e. category 1 responders); the purpose of this interview is therefore to gauge your needs and to understand the level of detail you would require to enhance your role in flood incident management.

The DSS seeks to combine existing flood inundation model outputs with a measure for social vulnerability, at the household level for those at risk, thereby offering an integrated approach to flood risk communication. The methods developed will be ultimately presented to the Flood Risk Management Research Consortium (FRMRC2). While there will be some valuable findings that can be integrated into current systems already in use, this DSS is not specifically designed for direct application – rather, it is an opportunity for me to explore the methods and value of this approach. Furthermore, it is not designed to operate in real-time situations, though may prove useful from a contingency planning perspective.

This interview is semi-structured, so if there are any further points that you would like to raise then please feel free to do so; alternatively if there are any questions that you do not wish to answer please let me know. Your personal details will be kept anonymous and confidential. This meeting will be recorded.

Interviewer:.....	Date of interview:..../...../.....
Interviewee:…….	
Position:…….....	Organisation:……

1. Can you please describe the role of your {organisation} throughout the course of a flood event (i.e. from preparation, response and aftermath).

2. What is your specific role during a flood incident?
   Please feel free to draw on your previous experience.

3. Is there any difference in flood management between different types of flood events (fluvial, pluvial, tidal)?

4. Are there existing DSS/other tools available within {the organisation} that are used either from a planning or training perspective, or applied in real-time which are used in flood events?
   If yes, can you please elaborate on the specifics that you are aware off.
   Do you have any direct, hands-on experience with this system?

5. What information do you require in order to fulfil your role?
   If existing systems are in place, do they meet this requirement?

6. From a contingency planning point-of-view, what do you feel are the main components that a successful DSS would need to include?

7. The DSS that I am developing aims to integrate social data concerning the residents at risk. What is your understanding of the term social vulnerability?

8. What information is currently held concerning the local community at risk? How is it stored (database, GIS)?

9. What characteristics of an individual/household do you feel would heighten their level of social vulnerability?

10. There has been a significant amount of research into indicators of social vulnerability. Here is a list of some individual and household characteristics – which ones (if any) do you feel would make a person/household more vulnerable to the adverse impacts of flooding.

Age 75 yrs +
Health status
Single parent household
Length of residency
Past experience
Race
Ethnicity
Language (first language is not English)
Education
Gender
Unemployment
Economic status
Access to a vehicle
Access to social networks (family, friends, neighbours)
Home ownership
Home insurance

Are there any more variables that you can think of?

11. At what stage during the flood event do you feel the characteristics you selected are influential (preparation, response, recovery).

	Preparation	**Response**	**Recovery**
Age 75 years +			
Health status			
Single parent household			
Length of residency			
Past experience			
Race			
Ethnicity			
Language (first language is not English)			
Education			
Gender			
Unemployment			
Economic status			
Access to a vehicle			
Access to social networks (family, friends, neighbours)			
Home ownership			
Home insurance			

12. Do you think it is important to include this type of detail (i.e. social vulnerability) within a DSS for flood incident management?
If yes, what information do you think you would require?
(*Please feel free to draw from those listed previously*)

13. The DSS that I will be developing aims to function as interactively as possible/as required by the end-user. Here is a short list of some of the features that I would like to include: Could you please rate these on a 1 – 5 scale on level of usefulness. Please circle.

1	2	3	4	5
Very Useful		Neither useful nor useless		Very useless

a) Ability to select a number of flood scenarios (2yr, 10yr, 20yr, 30yr, 50yr and 100yr return period flood events)

b) Ability to either run the full duration of the event (up to 720 minutes) (i.e. animation), or to select a given time (snapshot)

c) Ability to zoom in or out of a given area of interest

d) Ability to obtain summary flood statistics at a point location (e.g. depth and velocity details at a specific manhole, for a specific event and the range across all events)

e) The option to use an enquiry function, whereby the user can ask a specific question (e.g. identify all areas flooded to depths greater than … within a …specified time… or specified event/across all events).

f) The ability to view results within a 3D environment (based on terrestrial LiDAR scanning of the area)

g) Ability to obtain summary statistics for social vulnerability i.e. at the street level

14. In your opinion is there is a value for integrating social and physical dimensions of flood risk in one DSS?

15. How would this integration of information (both physical and social) help you to respond?

16. In your opinion is there value to supplying this data at the *household level*? Please explain your answer.

In due course, I would like to present the final product to you (most likely within a focus group setting with other category 1 responders), to evaluate your views on the potential effectiveness/or existing limitations of the tool developed. Is this something you would be willing to take part in?

YES / NO

Thank you for taking the time to complete this interview with me. On a final note, is there any other information/comments or views that you would like to add? If you have any further information that comes to mind in due course, please feel free to contact me.

END OF INTERVIEW

END OF C3

C4 QUESTIONNAIRE ADMINISTERED WITH COGNITIVE INTERVIEW

Now you have had an opportunity to see and interact with the Flood Risk Assessment Tool (here forth "the tool"), please take 10 minutes to complete this questionnaire about your opinions of the tool. The tool was designed to explore new ways of presenting flood hazard, vulnerability and risk. These questions will address your views on the effectiveness of the tools features, functions and whether you feel any aspect could be used to support your current role and decision making.

1. Job title:

2. Organisation:

The Hazard Face: The following questions are interested in your opinions regarding the presentation of flood hazard information. Please rate each aspect of the tool on a scale of 1 to 5 according to degree of *usefulness*. (Indicate by ticking the box)

Option to view…	1 **Not useful**	2	3 **Neither useful nor un-useful**	4	5 **Highly useful**
3. A range of flood scenarios for flood events					
4. Different types of flooding (fluvial, pluvial and combined)					
5. Flooding in terms of the hazard posed					
6. Adjust hazard thresholds					
7. Select hazard model Please tick which one you would select, then rate the value of this. **HM1** ○ **HM2** ○					
8. Flood hazard along road networks only					
9. Flood hazard for properties affected only					
10. Animation of flooding					
11. Adjust the time-bar and select a specific point in time to view flood					
12. Background information page to explain the modelling, hazard calculation and uncertainty					

13. To what extent could the details presented on the hazard face of the tool be used to support your role? *(Please note what aspects of your job where this information could be most helpful)*

The Vulnerability Face: The following questions are interested in your opinions regarding the presentation of flood vulnerability information. Please rate each aspect of the tool on a scale of 1 to 5 according to degree of *usefulness*. (Indicate by ticking the box)

Option to view…	1 **Not useful**	2	3 **Neither useful nor un-useful**	4	5 **Highly useful**
14. Vulnerability at different geographical scales (based on the Social flood vulnerability index)					
15. Option to adjust the social flood vulnerability index to different geographical scales (nation, region, district, town)					
16. Vulnerability indicators at the very local scale					
17. Selection a number of potential indicators of vulnerability					
18. An expert-declared explanation accompanying each indicator					
19. Combine indicators of vulnerability and build your own vulnerability index					

20. To what extent could the details presented on the vulnerability face of the tool be used to support your role? *(please note what aspects of your job where this information could be most helpful)*

The Risk Face: The following questions are interested in your opinions regarding the presentation of flood risk information. Please rate each aspect of the tool on a scale of 1 to 5 according to degree of *usefulness*. (Indicate by ticking the box)

Option to view…	1 **Not useful**	2	3 **Neither useful nor un-useful**	4	5 **Highly useful**
21. Option to combine vulnerability and hazard layers					
22. Option to select the importance of vulnerability and hazard in the risk equation					

23. Please indicate which weight you would assign to hazard and vulnerability in calculating risk: *Please tick*

Hazard and Vulnerability *as equal*	
Hazard *x1* + Vulnerability	
Vulnerability *x1* + Hazard	
Hazard *x2*+ Vulnerability	
Vulnerability *x2*+ Hazard	

24. Please justify your answer to Q23.

Overall views: The following questions are interested in your overall views of the tool. Please rate each question according to degree to which you feel it is a strength of the tool.

	1 **A Limitation**	2	3 **Neither a limitation nor a strength**	4	5 **A strength**
25. Interactive nature of the tool					
26. User-friendly					
27. Simple					
28. Presentation (i.e. distinct pages for hazard, vulnerability and risk)					

CONTINUE ON NEXT PAGE

29. Please indicate how helpful you feel the component parts of this tool would be in informing emergency management:

	1 Not useful	2	3 Neither useful nor un-useful	4	5 Highly useful	Further comments and specifics
Hazard face						
Planning						
Response						
Recovery						
Longer-term mitigation						
Training and exercising						
Vulnerability face						
Planning						
Response						
Recovery						
Longer-term mitigation						
Training and exercising						
Risk face						
Planning						
Response						
Recovery						
Longer-term mitigation						
Training and exercising						

30. Is there anything that you would change or include that was not included in the tool?

END OF QUESTIONNAIRE

END OF C4

C5 METHODS FOR CREATING “KEEPER”

{AVAILABLE ON REQUEST]

END OF APPENDIX C